THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY,

INCLUDING

ZOOLOGY, BOTANY, AND GEOLOGY.

(BEING A CONTINUATION OF THE 'ANNALS' COMBINED WITH LOUDON AND CHARLESWORTH'S 'MAGAZINE OF NATURAL HISTORY.')

CONDUCTED BY

ALBERT C. L. G. GÜNTHER, M.A., M.D., Ph.D., F.R.S.,
WILLIAM CARRUTHERS, F.R.S., F.L.S., F.G.S.,
AND
WILLIAM FRANCIS, F.L.S.

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"Omnes res creatæ sunt divinæ sapientiæ et potentiæ testes, divitiæ felicitatis humanæ:—ex harum usu *bonitas* Creatoris; ex pulchritudine *sapientia* Domini; ex œconomiâ in conservatione, proportione, renovatione, *potentia* majestatis elucet. Earum itaque indagatio ab hominibus sibi relictis semper æstimata; à verè eruditis et sapientibus semper exculta; malè doctis et barbaris semper inimica fuit."—Linnæus.

"Quel que soit le principe de la vie animale, il ne faut qu'ouvrir les yeux pour voir qu'elle est le chef-d'œuvre de la Toute-puissance, et le but auquel se rapportent toutes ses opérations."—Bruckner, *Théorie du Système Animal*, Leyden, 1767.

. The sylvan powers
Obey our summons; from their deepest dells
The Dryads come, and throw their garlands wild
And odorous branches at our feet; the Nymphs
That press with nimble step the mountain-thyme
And purple heath-flower come not empty-handed,
But scatter round ten thousand forms minute
Of velvet moss or lichen, torn from rock
Or rifted oak or cavern deep: the Naiads too
Quit their loved native stream, from whose smooth face
They crop the lily, and each sedge and rush
That drinks the rippling tide: the frozen poles,
Where peril waits the bold adventurer's tread,
The burning sands of Borneo and Cayenne,
All, all to us unlock their secret stores
And pay their cheerful tribute.

J. Taylor, *Norwich*, 1818.



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ERRATA.

Page 82, line 5, *for* Owsten *read* Owston.
Pages 82, 85, 86, 92, 93, and Plate V., for *Owsteni* read *Owstoni*.

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[SEVENTH SERIES.]

"..... per litora spargite muscum,
Naiades, et circùm vitreos considite fontes:
Pollice virgineo teneros hic carpite flores:
Floribus et pictum, divæ, replete canistrum.
At vos, o Nymphæ Craterides, ite sub undas;
Ite, recurvato variata corallia trunco
Vellite muscosis e rupibus, et mihi conchas
Ferte, Deæ pelagi, et pingui conchylia succo."
N. Parthenii Giannettasi, Ecl. I.

No. 79. JULY 1904.

I.—*Natural History Notes from H.M. Indian Marine Survey Steamer 'Investigator,' Commander T. H. Heming, R.N.*—Series III., No. 1. *On Mollusca from the Bay of Bengal and the Arabian Sea.* By Edgar A. Smith, I.S.O.

[Concluded from vol. xiii. p. 473.]

Capulus lissus, Smith.

Capulus lissus, Smith, Ann. & Mag. Nat. Hist. 1894, vol. xiv. p. 166, pl. iv. figs. 4–6.

Hab. Stations 233, 236, 237, and 240, off Andamans, 90–303 fath.; off Travancore coast, 360 fath.

Very frequently young specimens are found adhering to older examples. The shape is variable and the outline of the aperture often very irregular, the irregularity being occasioned by the different surfaces to which the specimens have been attached. The general cap-shaped form is, however, persistent.

Capulus fragilis, sp. n.

Testa tenuis, depresse pileiformis, pellucido-albida, periostraco tenui flavescente induta, lineis incrementi tenuissimis sculpta, intus

alba, postice infra apicem septo arcuato latiusculo instructa; apex terminalis, parvus, acute unciformis, valde recurvus, extra marginem productus; apertura ovata.
Longit. 13 mm., diam. 10⅓, alt. 4.

Hab. Laccadive Sea, 105 fath.; Bay of Bengal, 410 fath.

Remarkable for the depressed cap-like form, the slimness of the shell, and the internal septum, as in the genus *Septaria*. The protoconch has merely the appearance of a curved hook.

Delphinula laciniata, Lamarck, var.

Hab. Off south coast of Ceylon, 34 fath.

Three small specimens agreeing closely with the variety named *D. aculeata* by Reeve.

Liotia crenata, Kiener.

Liotia crenata, Pilsbry, Man. Conch. vol. x. p. 111, pl. xxxvi. figs. 12, 13.

Hab. Off south coast of Ceylon, 34 fath. ('Investigator'); Philippines (*Cuming*).

Thalotia maldivensis, Smith, var.

Thalotia maldivensis, Smith, Gardiner's 'Fauna and Geography of the Maldive and Laccadive Archipelagoes,' vol. ii. pt. 2, p. 617, pl. xxxv. figs. 25, 26.

Hab. Off south coast of Ceylon, 34 fath.

Differing from the typical form in having rather coarser granulation and the second row of granules below the suture are conspicuously larger. In one example the two adjacent series of granules at the periphery, which wind up the spire, are conspicuously spotted with pink, and large blotches of a dark olive-green upon the middle of the whorls at intervals occur under one another, thus forming three interrupted stripes which descend from the apex to the angle of the body-whorl. The granules upon the base are small, closely packed, and mostly white with pink dots between them. Another variety is almost entirely yellow, but some obscure white spots occur upon the periphery and the lower surface.

Bathybembix Wood-Masoni, Smith.

Bathybembix Wood-Masoni, Smith, Ann. & Mag. Nat. Hist. 1895, vol. xvi. p. 7, pl. i. fig. 11.

Hab. Station 233, off Andaman Islands, 185 fath.

Solariella infundibulum (Watson).

Solariella infundibulum, Smith, Ann. & Mag. Nat. Hist. 1894, vol. xiv. p. 367.

Hab. Same as preceding species.

Agreeing in all respects with the Gulf of Manaar specimens previously recorded.

Solariella oxycona, Smith.

Solariella oxycona, Smith, Ann. & Mag. Nat. Hist. 1899, vol. iv. p. 248; Illust. Zool. 'Investigator,' pl. xii. figs. 6–6 *b*.

Hab. Off Andaman Islands, in 490 fath.

Ethalia striolata, A. Adams.

Umbonium (*Ethalia*) *striolatum*, A. Adams, Proc. Zool. Soc. 1853, p. 189.

Hab. Off south coast of Ceylon, 34 fath. ('Investigator'); Borneo (*A. Ad.*).

Flatter and more sharply angled at the periphery than *E. guamensis*, with less convex whorls and a different umbilical callus, also much more distinctly spirally striated. It is variable in colour. I have been unable to trace the *Rotella trilobata* which is stated by Sowerby to be in the British Museum, and which looks very like this species, judging from the figure (Conch. Icon. vol. xx. pl. iv. fig. 20). It is regarded as a variety by Pilsbry, who appears never to have seen either form.

Astralium girgyllus (Reeve).

Trochus girgyllus, Reeve, Conch. Icon. vol. xiii. fig. 53.
Turbo (*Bolma*) *gyrilius* (sic), Reeve, Sowerby, Thes. Conch. vol. v. p. 208, pl. 499. fig. 73 (incorrectly coloured).
Astralium (*Bolma*) *modestum*, Reeve, var. *girgyllus*, Pilsbry, in Tryon's Man. Conch. vol. x. p. 230, pl. lv. fig. 65.
Calcar modestum, var. B, Fischer, in Kiener's Icon. Coq. Viv. p. 6, pl. lxxvi. fig. 1.

Hab. China (*Reeve*), off Andaman Islands, in 41 fath. ('Investigator').

A single half-grown example, in perfect condition, with the operculum. The latter is almost white, thick, convexly arched and granulated, showing that this species does not belong to the section *Bolma*. It is much paler in tint than the type figured by Reeve, and the series of granules which adorn the whorls are rather finer, and the two rows of scale-like projections are much produced and beautifully striated behind. The shell is such a gem in form and ornamentation

that I regret having to return it to the Indian Museum at Calcutta. On comparing this species with *A. modestum* of Reeve, with which it has been united, there seem to be sufficient differences to warrant their separation. The sculpture on the base of the last whorl is much finer in *A. modestum*, and the groove in the umbilical region of *A. girgyllus* is absent in the Japanese form. There are also differences of colour.

Astralium bathyrhaphe, Smith.

Astralium bathyrhaphe, Smith, Ann. & Mag. Nat. Hist. 1899, vol. iv. p. 247; Illust. Zool. 'Investigator,' pl. xii. figs. 4–4 *c*.

Hab. Station 218, N. Maldive Atoll, in 210 fath.

Turbo (*Cantrainea*?) *incoloratus*, Smith.

Turbo (*Cantrainea*?) *incoloratus*, Smith, Ann. & Mag. Nat. Hist. 1899, vol. iv. p. 247; Illust. Zool. 'Investigator,' pl. xii. figs. 5, 5 *a*.

Hab. Station 232, lat. 7° 17′ 30″ N., long. 76° 54′ E., off South India, in 430 fath.

Leptothyra delecta, Smith.

Leptothyra delecta, Smith, Ann. & Mag. Nat. Hist. 1899, vol. iv. p. 248; Illust. Zool. 'Investigator,' pl. xii. figs. 3, 3 *a*.

Hab. Station 237, lat. 13° 17′ N., long. 93° 7′ E., off Andaman Islands, 90 fath.

Acmæa minutissima, sp. n.

Testa minuta, angusta, oblonga, alba, tenuis, lineis incrementi striata, lateribus subparallelis vix excurvatis; apex mediocriter elatus, submammillatus, vix centralis, subacutus.
Longit. $3\frac{1}{2}$ mm., diam. $1\frac{1}{3}$, alt. 1.

Hab. Andaman Islands, 130–250 fath., upon slender pieces of water-logged wood.

Of the same character as *A. depicta*, Hinds, and *A. paleacea*, Gould, from California, but differing in its minute size, sculpture, and colour.

Fissurella delicata, Smith.

Fissurella delicata, Smith, Ann. & Mag. Nat. Hist. 1899, vol. iv. p. 249; Illust. Zool. 'Investigator,' pl. xii. figs. 8, 8 *a*.

Hab. Station 232, off Travancore coast, 430 fath.

Puncturella (*Cranopsis*) *indica*, Smith.

Puncturella (*Cranopsis*) *indica*, Smith, Ann. & Mag. Nat. Hist. 1899, vol. iv. p. 249; Illust. Zool. 'Investigator,' pl. xii. figs. 7, 7 *a*.

Hab. Station 232, off Travancore coast, 430 fath.

Puncturella (*Cranopsis*) *asturiana* (Fischer).

Puncturella (*Cranopsis*) *asturiana*, Smith, Ann. & Mag. Nat. Hist. 1896, vol. xviii. p. 371.

Hab. Station 232, off Travancore coast, in 430 fath. Other localities are Bay of Biscay, West Indies, and off Ceylon, in 85 to 670 fath.

The single specimen obtained differs from that dredged in 390 fathoms off Culebra Island, West Indies, by the 'Challenger,' only in having the radiating costellæ slightly coarser. The general outline of the shell and the character of the fissure both within and externally are the same. The costellæ, being coarser, produce a slightly more strongly crenulated margin within. Length 17 mm., diam. 12, alt. 8.

Scaphander ceylanica, sp. n.

Testa parva, oblonga, angusta, tenuis, pallide fuscescens, transversim striata, striis pallidis, minute punctatis; spira involuta, excavata, albida; columella arcuata, incrassata, reflexa; labrum tenuissimum, supra spiram productum.

Longit. 9 mm., diam. 4.

Hab. Off south coast of Ceylon, 34 fath.

A slender shell, of a pale brown colour, ornamented with whitish punctate striæ; the striæ at both ends of the whorl are closer and deeper than those upon the central part, and form distinct liræ between them.

Scaphander andamanicus, Smith.

Scaphander andamanicus, Smith, Ann. & Mag. Nat. Hist. 1894, vol. xiv. p. 167, pl. iv. fig. 15.

Hab. Station 233, Andaman Islands, in 185 fath.

A single specimen only. Much larger than the type, being 25 mm. in length and 18 in diameter.

Atys cylindrica, Helbling.

Hab. Off Andaman Islands, 15 fath.

A few young shells only.

Atys hyalina, Watson.

Atys hyalina, Watson, Gasteropoda 'Challenger' Exped. p. 640, pl. xlviii. fig. 1.

Hab. Off Andaman Islands, 15 fath.

A single specimen, agreeing in every respect with the type from Fiji. It is, however, rather larger, being 15½ mm. in length.

Atys darnleyensis, Brazier.

Atys darnleyensis, Brazier, Pilsbry, Man. Conch. vol. xv. p. 272.

Hab. Off Andaman Islands, 15 fath.

Agreeing precisely with specimens from Darnley Island received from Brazier. Perhaps belonging to the genus *Cylichna*.

Atys submal'eata, sp. n.

Testa tenuis, pellucida, elongato-ovata, utrinque imperforata, incrementi lineis striata, lineis subdistantibus transversis leviter malleata, utrinque tenuiter transversim striata; labrum tenuissimum, paulo supra spiram productum; apertura antice subcanaliculata; columella tortuosa, incrassata, reflexa, appressa, apex concave impressus.
Longit. 17 mm., diam. 9.

Hab. Off Andaman Islands, 15 fath.

A very thin species, peculiarly malleated. The labrum arises from the middle of the impressed spire, is there slightly thickened, but has no twist as in the typical forms of the genus.

Cylichna andamanica, sp. n.

Testa irregulariter ovata, utrinque umbilicata, solidiuscula, alba, supra et infra transversim confertim striata, in medio lævis; anfractus ultimus paulo infra apicem leviter constrictus; labrum intus incrassatum, ad marginem acutum; columella leviter tortuosa, antice reflexa, ad basim effusa.
Longit. 9 mm., diam. 5.

Hab. Off Andaman Islands, 15 fath.

Rather solid for so small a shell. The slight constriction at the upper part of the body-whorl forms a solid crest above it. The apical perforation is very small and deep—indeed, narrower than the umbilicus. A very thin callus spreads over the whorl, uniting the columella and the upper end of the labrum.

Chiton ceylanicus, sp. n.

Testa *C. canaliculato* similis, sed areis centralibus inter liris punctatis, valva antica costis granosis circiter 36 ornata, cingulo squamis minutis amicto.
Longit. 14 mm., diam. 8.

Hab. Off south coast of Ceylon, 34 fath.

This species is rather like *C. canaliculatus*, Quoy & Gaim., but differs in the central areas being more finely lirate, punctate between the liræ, and the scales on the girdle are much finer. The valves are dirty white, here and there stained and dotted with light olive-brown, with a few darker dots on the posterior edge of the anterior and central valves.

Angasia tetrica, Carpenter.

Angasia tetrica, Carp., Pilsbry, Man. Conch. vol. xiv. p. 287, pl. lxi. figs.

Hab. Off south coast of Ceylon, 34 fath.

The specimens from this locality agree exactly with the variety *calculosa* from the Philippine Islands.

Dentalium Shoplandi, Jousseaume.

Dentalium Shoplandi, Jousseaume, Bull. Soc. Philom. 1894, vol. vi. p. 102.

Hab. Station 229, off Travancore coast, in 360 fath. ('Investigator'); Gulf of Aden, 670 fath. (*Jousseaume* and Brit. Mus.).

The ridges in this species vary from sixteen to about twenty-two. None of the specimens, although not much broken away towards the apex, exhibit any trace of a slit. The largest example is 100 mm. in length and 12 in width.

Dentalium magnificum, Smith.

Dentalium magnificum, Smith, Ann. & Mag. Nat. Hist. 1896, vol. xviii. p. 371.

Hab. Station 232, off Travancore coast, in 430 fath.

The riblets are finer and more numerous in this species than in *D. Shoplandi*, and the apex is deeply slit.

Xylophaga indica, sp. n.

Testa *X. dorsali* similis, sed valvis sulco mediano æqualiter bipartitis, lira interna æque centrali.
Diam. 12 mm., longit. umbone ad marginem ventralem 12.

Hab. Station 233, off Andamans, 185 fath.

Very like *X. dorsalis*, but the valves are more equally divided down the middle by the central groove, so that the anterior and posterior portions are about equal. In *X. dorsalis* they are decidedly unequal, the posterior side being conspicuously larger. This is clearly seen within the valves, being indicated by the position of the strengthening rib.

The sculpture on the anterior areas and the protoplaxes are similar in both forms. I am inclined to think that the latter will be found to be somewhat variable in form.

Anatina andamanica, sp. n.

Testa tenuissima, subpiriformis, antice late rotundata, postice obtuse rostrata, inæquilateralis, æquivalvis, mediocriter convexa, pellucido-albida, lineis incrementi striata; umbones prominentes, contigui, circiter in $\frac{1}{3}$ longitudinis collocati; pagina interna nitida, vix margaritacea; sinus pallii profunde rotundatus; fulcra ligamenti parva.

Longit. 18 mm., alt. 14, diam. 10.

Hab. Lat. 11° 32′ N., long. 92° 46′ E., off west of Andamans, 194 fath.

Shorter and rounder than many of the known forms. The rostrate end exhibits slight traces of a periostracum.

Euciroa eburnea (Wood-Mason & Alcock).

Verticordia (*Euciroa*) *eburnea*, Wood-Mason & Alcock, Ann. & Mag. Nat. Hist. 1891, vol. viii. p. 447, fig. 14.

Verticordia optima, Sowerby, Proc. Malac. Soc. vol. i. p. 39, pl. v. fig. 3; *op. cit.* p. 82, as *V. eburnea*, W.-M. & Al.

Hab. Andaman Sea, 188–220 fath., and Stations 229 and 232, off Travancore coast, in 360–430 fath.

Very similar to *E. elegantissima*, Dall, from the Antilles, and *V. pacifica*, Dall, from the Hawaiian Islands. Are they sufficiently distinct to be regarded as different species, or are they not merely variations of one widely distributed form?

It is curious to note that the localities of the three species lie between 11° and 24° north of the equator, at depths ranging from 188 to 756 fathoms, with a bottom-temperature of 38°, 40°, and 55°.

The size and number of the granules referred to by Dr. Dall* as distinguishing this species from *E. eburnea* are variable, for in one specimen from the Andamans they are quite as fine and as numerous as in one example of *E. pacifica* in the Museum collection.

* Proc. U.S. Nat. Mus. 1894, vol. xvii. p. 689.

Myodora quadrata, Smith.

Myodora quadrata, Smith, Ann. & Mag. Nat. Hist. 1899, vol. iv. p. 250; Illust. Zool. 'Investigator,' pl. xiii. figs. 5, 5*a*.

Hab. Station 229, off Travancore coast, in 360 fath.; also Station 233, off Andaman Islands, in 185 fath.

Vesicomya indica, sp. n.

Testa transversim ovata, subglobosa, valde inæquilateralis, alba, cretacea, lineis incrementi tenuibus striata, antice angustata, postice late rotundata; lunula magna, elongato-cordiformis, in medio prominens, carinata, linea impressa circumscripta; umbones incurvati, fere contigui, circiter in $\frac{1}{4}$ longitudinis collocati; valvæ mediocriter crassæ, intus albidæ, et obscure tenuiter radiatim striatæ; cicatrix antica elongato-piriformis, postica latior; sinus pallii minime profundus.

Longit. 49 mm., alt. 37, diam. 27.

Hab. Off Travancore coast, 360 fath.; off Andamans, 405 fath.

The dentition is practically identical with that of *V. lepta*, Dall (see Smith, Proc. Malac. Soc. vol. iv. p. 82, fig. ii.).

Mactrinula Reevesii, Gray.

Mactra Reevesii, Gray, Reeve, Conch. Icon. vol. viii. fig. 92.

Hab. Off Chedubar, Aracan coast, 20-30 fath.

Cardita elegantula, Deshayes.

Cardita elegantula, Deshayes, Proc. Zool. Soc. 1852, p. 101, pl. xvii. figs. 6, 7.

Hab. Off Coromandel coast, 41 fath.; Chinese Seas (*Deshayes*).

Crassatella radiata, var.

Crassatella radiata, Sowerby, Reeve, Conch. Icon. vol. i. fig. 12.

Hab. Off Mangalore, Malabar coast, 26-30 fath.; Singapore (*Reeve*).

Cardium (*Ctenocardia*) *victor*, Angas.

Cardium (*Ctenocardia*) *victor*, Angas, Proc. Zool. Soc. 1872, p. 612, pl. xlii. fig. 9.

Hab. Off south coast of Ceylon, 34 fath.; Maldive Islands (*Smith*); Mauritius (*Angas* and Brit. Mus.).

Cardium coronatum, Spengler.

Hab. Off Cheduba, Aracan coast, 20–30 fath.

Cardium (*Fragum*) *hemicardium*, Linn.

Hab. Off Andamans, 15 fath.

Lucina bengalensis, Smith.

Lucina bengalensis, Smith, Ann. & Mag. Nat. Hist. 1894, vol. xiv. p. 171, pl. v. figs. 1, 2.

Hab. Stations 229 and 232, off Travancore coast, 360 and 430 fath.

The largest specimen is 47 mm. in length, 42 high, and 22 in diameter, these dimensions considerably exceeding those of the type.

Lucina dentifera, Jonas.

Lucina dentifera, Jonas, Reeve, Conch. Icon. vol. vi. figs. 10 *a*, *b*.

Hab. Off Mangalore, Malabar coast, 26–30 fath; Red Sea (*Jonas*).

Cryptodon investigatoris, Smith.

Cryptodon investigatoris, Smith, Ann. & Mag. Nat Hist. 1895, vol. xvi. p. 13, pl. ii. figs. 6, 6 *a*; *op. cit.* 1896, vol. xviii. p. 374.

Hab. Station 232, off Travancore coast, in 430 fath.

Three left valves. Hitherto only right valves have been observed, so that it was somewhat doubtful whether the valves were similar; such, however, proves to be the case.

Psammobia arakanensis, sp. n.

Testa oblonga, antice angustata, acute rotundata, postice latior, oblique truncata, æquilateralis, compressa, tenuis, alba, nitida, lineis elatis, tenuibus, obliquis, postice sulca radiante oblique interruptis, ornata, pone sulcum tenuiter lamellata; margo dorsi anticus rectiusculus, leviter declivis, posticus paulo incurvatus; sinus pallii profundus, latus; valvæ tenues, intus pallidæ.
Longit. 31 mm., alt. 16·5, diam. 7·5.

Hab. Off Cheduba, Arakan coast, 20–30 fath.

About two thirds of the surface, which is marked off by an oblique groove posteriorly, is covered with rather distant raised oblique lines. This portion of the shell is glossy and exhibits innumerable delicate, hair-like, anastomosing lines in the texture. The hinder portion is less shining and is marked

with regular lamellæ of growth. *P. bipartita*, Philippi (Reeve, Conch. Icon. vol. x. fig. 60), has somewhat similar sculpture, but the anterior oblique lines are much more numerous and closer together and the form is different.

Tellina travancorica, Smith.

Tellina travancorica, Smith, Ann. & Mag. Nat. Hist. 1899, vol. iv. p. 249; Illust. Zool. 'Investigator,' pl. xiii. figs. 1, 1 *a*.

Hab. Station 229, off Travancore coast, in 360 fath.

Abra affinis, Smith.

Abra affinis, Smith, Ann. & Mag. Nat. Hist. 1899, vol. iv. p. 250; Illust. Zool. 'Investigator,' pl. xiii. figs. 2, 2 *a*.

Hab. Off Travancore coast, in 498 fath.

Abra maxima, Sowerby.

Abra maxima, Sowerby, Smith, Ann. & Mag. Nat. Hist. 1894, vol. xiv. p. 169, pl. v. figs. 5, 6; *op. cit.* 1895, vol. xvi. p. 10.

Hab. Off Andamans, 405 fath.

Myrina indica, sp. n.

Testa *M. Simpsoni* simillima, sed minus polita, lineis incrementi tenuibus sculpta, postice setis paucis brevibus munita.
Longit. 11·5 mm., alt. 5, diam. 4.

Hab. Station 233, off Andamans, 185 fath.

Practically identical in form with *M. Simpsoni*, Marshall, from the North Sea*. It, however, is less glossy and exhibits rather more distinct lines of growth, and down the hinder slope a few very short epidermal bristles are observable. Under a strong lens microscopic radiating striæ are visible, especially at the anterior end. The above are probably not the full dimensions attained by this species.

Septifer bilocularis, Linn.

Hab. Off Chedubar, Aracan coast, 20–30 fath., and Diamond Island, Aracan coast.

Modiola Watsoni, Smith.

Modiola Watsoni, Smith, 'Challenger' Lamellibranchiata, p. 275, pl. xvi. figs. 5–5 *c*.

Hab. Off Andaman Islands, 194 fath.

* J. Malacol. vol. vii. p. 168, figs. 1–3.

Arca (*Barbatia*) *pteroessa*, Smith.

Arca (*Barbatia*) *pteroessa*, Smith, 'Challenger' Lamellibranchiata, p. 262, pl. xvii. figs. 4-4 *b*.

Hab. Station 111, Bay of Bengal, 1644 fath.

The specimens from this locality are scarcely as narrowed anteriorly as some of those obtained by the 'Challenger' expedition, but they do not seem sufficiently different to warrant their specific separation.

Arca (*Barbatia*) *incerta*, Smith.

Arca (*Barbatia*) *incerta*, Smith, Ann. & Mag. Nat. Hist. 1899, vol. iv. p. 251; Illust. Zool. 'Investigator,' pl. xiii. figs. 3, 3 *a*.

Hab. Station 232, off Travancore coast, in 430 fath.

Arca domingensis, Lamarck.

Hab. Off Mangalore, Malabar coast, 26–30 fath.

Arca consociata, Smith.

Arca (*Scapharca*?) *consociata*, Smith, 'Challenger' Lamellibranchiata, p. 266, pl. xvii. figs. 7–7 *a*.

Hab. Off Chedubar, Aracan coast, 20–30 fath.; Arafura Sea, 25 fath. ('Challenger').

In this species the valves are similar.

Limopsis indica, Smith.

Hab. Off Travancore coast, 360 fath.; Maldive Islands, 770–960 fath.

Nucula mitralis, Hinds.

Nucula mitralis, Hinds, Hanley in Sowerby's Thesaurus Conch. vol. iii. p. 152, pl. ccxxx. fig. 144.

Hab. Mouth of the River Hughli.

Nucula (*Acila*) *Fultoni*, Smith.

Nucula (*Acila*) *Fultoni*, Smith, Illust. Zool. 'Investigator,' Mollusca, pl. i. figs. 3–3 *c*.

Hab. Off Travancore coast, 360 fath.

Nuculana fragilis, Chemn.

Leda fragilis, Chemn., Hanley in Sowerby's Thesaurus Conch. vol. iii. p. 122, pl. ccxxx. fig. 171.

Hab. Dredged off the sandheads at the mouth of the River Hughli; China (*Hanley*).

Spondylus imperialis, Chenu.

Hab. Off south coast of Ceylon, 34 fath.

Pecten Alcocki, sp. n.

Testa æquivalvis, æquilateralis, tenuissima, subpellucida, rotundata, seriebus radiantibus et concentricis, numerosis squamarum minutarum ornata, mediocriter convexa, radiatim tenuiter striata; auriculæ inæquales, antica valvæ dextræ infra profunde sinuata, liris quaternis granosis radiata.
Longit. 18 mm., alt. 19, diam. 7.

Hab. Station 232, off South India, 430 fath.

The radiating striæ have the appearance of short scratches and are closer together down the sides of the valves. The scales which roughen the surface are generally more or less worn off, their position being indicated by the crenulated concentric lines of growth.

Pecten mirificus, Reeve.

Pecten mirificus, Reeve, Conch. Icon. vol. viii. fig. 104.

Hab. Off south coast of Ceylon, 34 fath.; Amboyna (*Reeve*); Maldive Islands (*Gardiner*),

Pecten nux, Reeve.

Pecten nux, Reeve, Conch. Icon. vol. viii. fig. 143 (errata).

Hab. Off south coast of Ceylon, in 34 fath.; Maldive Islands (*Gardiner*); Marquesas Island (*Reeve*).

Pecten speciosus, Reeve.

Pecten speciosus, Reeve, Con. Icon. vol. viii. fig. 112.

Hab. Off south coast of Ceylon, 34 fath.; Philippine Islands (*Reeve*).

One valve only.

Janira Gardineri, Smith.

Janira Gardineri, Smith, in Gardiner's 'Fauna and Geography of the Maldive and Laccadive Archipelagoes,' vol. ii. p. 622, pl. xxxvi. figs. 21, 22.

Hab. Off south coast of Ceylon, 34 fath.

Amussium caducum, Smith.

Amussium caducum, Smith, 'Challenger' Lamellibranchiata, p. 309, pl. xxiii. figs. 1–1 *c*; Ann. & Mag. Nat. Hist. 1894, vol. xiv. p. 173.

Hab. Andamans, 490 fath.; off Colombo, 531 fath.

Amussium andamanicum, Smith.

Amussium andamanicum, Smith, Ann. & Mag. Nat. Hist. 1894, vol. xiv. p. 172, pl. v. figs. 13, 14; *op. cit.* 1895, vol. xvi. p. 265.

Hab. Laccadive Sea, 865–880 fath.

Lima indica, Smith.

Lima indica, Smith, Ann. & Mag. Nat. Hist. 1899, vol. iv. p. 251: Illust. Zool. 'Investigator,' pl. xiii. figs. 4, 4 *a*.

Hab. Station 232, off Travancore coast, in 430 fath.

II.—*Descriptions of Two new Elapine Snakes from the Congo.* By G. A. Boulenger, F.R.S.

A small series of reptiles brought home from the Congo by Drs. Dutton, Christy, and Todd, of the Liverpool School of Tropical Medicine Expedition, contains examples of two poisonous snakes which are new to science and of which I have great pleasure in giving descriptions. The specimens, which have been presented to the British Museum, were obtained near Leopoldville.

Boulengerina Christyi.

Rostral once and a half as broad as deep, just visible from above; internasals as long as the præfrontals, extensively in contact with the præocular; frontal small, not longer than broad, broadest behind, forming very open angles in front and behind, not quite as long as its distance from the rostral, half as long as the parietals; supraocular much narrower than the frontal; posterior nasal in contact with the single præocular; two or three postoculars; temporals 2+2 or 2+3; seven upper labials, third and fourth entering the eye, fourth and fifth in contact with the lower postocular; four lower labials in contact with the anterior chin-shields; posterior chin-shields narrower and a little shorter than the anterior and separated by one scale. Scales in 19 rows on the neck, 17 on the body. Ventrals 221; anal entire; subcaudals 70. Blackish brown above, the nape and the anterior third of the body with irregular pale brown and black cross-bars, the black forming rings on the neck; upper lip pale brown, with black lines on the sutures between the shields;

lower surface of head brownish white, belly and lower surface of tail blackish.

Total length 465 mm.; tail 90.

A single young specimen.

We are now acquainted with four species of the genus *Boulengerina*, Dollo, for the determination of which the following key may be used:—

A. Rostral nearly as deep as broad; temporals 1+2; three upper labials in contact with the lower subocular.

Scales in 23 rows *B. annulata*, Buchh. & Ptrs.
Scales in 21 rows *B. Stormsi*, Dollo.

B. Rostral much broader than deep; temporals 2+2 or 2+3; two lower labials in contact with the lower subocular.

Scales in 23 rows *B. Dybowskii*, Mocq.
Scales in 17 rows *B. Christyi*, Blgr.

Elapechis Duttoni.

Snout very broadly rounded. Eye as long as its distance from the nostril. Rostral broader than deep, the portion visible from above measuring about one third its distance from the frontal; internasals a little shorter than the præfrontals; frontal slightly longer than broad, as long as its distance from the end of the snout, two thirds the length of the parietals; posterior nasal in contact with the single præocular; three postoculars; temporals 1+3; seven upper labials, third and fourth entering the eye, sixth largest; four lower labials in contact with the anterior chin-shields, which are separated from the symphysial; posterior chin-shields a little longer than the anterior. Scales very oblique, in 15 rows on the body, in 17 on the neck. Ventrals 150; anal entire; subcaudals 31 pairs. Pale brownish above, each scale with a black spot; a large black blotch on the head, descending as a bar on the temple, and followed by a whitish occipital transverse band; a black bar on the snout, connecting the nostrils, and a black spot below the eye; upper lip whitish, with the sutures between some of the shields black; lower parts whitish, the subcaudal shields edged with black.

Total length 520 mm.; tail 70.

A single specimen, apparently a male.

This very distinct species is more nearly related to *E. niger*, Gthr., from Zanzibar, than to any other.

III.—*Descriptions of new West-African Freshwater Fishes.* By G. A. Boulenger, F.R.S.

Barbus Ansorgii.

Depth of body $3\frac{1}{2}$ to $3\frac{3}{4}$ times in total length, length of head 4 to $4\frac{1}{3}$ times. Snout rounded, slightly projecting beyond the mouth, slightly shorter than the eye, the diameter of which is $3\frac{1}{2}$ times in length of head; interorbital width 3 times in length of head, width of mouth $3\frac{2}{3}$ times; lips feebly developed; anterior barbel a little shorter, posterior a little longer than eye, the distance between them about half diameter of eye. Dorsal III 7, last simple ray very strong, bony, strongly serrated behind, a little longer than head; free edge of the fin feebly concave; its distance from the occiput a little less than its distance from the caudal fin. Anal III 5, longest ray about $\frac{2}{3}$ length of head. Pectoral a little shorter than head, nearly reaching ventral; latter entirely in front of vertical of origin of dorsal. Caudal peduncle $1\frac{2}{3}$ times as long as deep. Scales 28–29 $\frac{4\frac{1}{2}}{4\frac{1}{2}}$, $2\frac{1}{2}$–3 between lateral line and ventral, 12 or 13 round caudal peduncle. Brownish above, silvery white beneath, with an ill-defined dark lateral band above the lateral line; fins uniform whitish.

Total length 70 mm.

Two specimens from the Luache River at Bange Ngola, Angola, collected by Dr. W. J. Ansorge.

The position of the ventrals in advance of the dorsal readily distinguishes this species from *B. Kessleri*, Stdr., originally described from Angola. The nearest ally of *B. Ansorgii* is *B. paludinosus*, Ptrs., from East Africa, which has shorter anterior barbels and more numerous scales.

Barbus Walkeri.

Depth of body 3 to $3\frac{1}{2}$ times in total length, length of head $3\frac{1}{2}$ to 4 times. Snout rounded, slightly projecting beyond the mouth, not longer than the eye; diameter of eye 4 times in length of head, interorbital width $2\frac{1}{3}$ to $2\frac{1}{2}$ times; width of mouth about $\frac{1}{3}$ length of head; lips moderately developed, interrupted on the chin; barbels two on each side, anterior $1\frac{1}{2}$ to $1\frac{2}{3}$, posterior 2 diameters of eye, the distance between them nearly equalling diameter of eye. Dorsal III 8, last simple ray flexible, not enlarged, $\frac{2}{3}$ to $\frac{3}{4}$ length of head; free edge of the fin straight; its distance from the occiput a little less than its distance from the caudal

fin. Anal III 5, longest ray $\frac{3}{5}$ to $\frac{2}{3}$ length of head. Pectoral about $\frac{2}{3}$ length of head, not reaching ventral; latter below anterior rays of dorsal. Caudal peduncle $1\frac{1}{2}$ to $1\frac{3}{4}$ times as long as deep. Scales 21–22 $\frac{3\frac{1}{2}}{4\frac{1}{2}}$, $2\frac{1}{2}$–3 between lateral line and ventral, 12 round caudal peduncle. Brown on the back, yellowish on the sides and below, the lateral scales brown at the base; two longitudinal dark brown streaks embracing the 8 to 10 first scales of the lateral line; four round black spots on each side, the second higher up than the others, just in front of the vertical of the origin of the dorsal fin, the third below the second half of the dorsal fin and above the lateral line, the fourth at the base of the caudal fin and traversed by the lateral line; a more or less distinct dark spot on each side of the vent; fins white, a few small black spots on the dorsal.

Total length 100 mm.

Gold Coast. Several specimens from Ingogosu, collected by the late Mr. R. B. N. Walker. These have been confounded by Dr. Günther with *B. trispilus*, Blkr., which differs in the smaller scales and in the markings.

Puntius (*Barbodes*) *camptacanthus*, Sauvage (Bull. Soc. Zool. France, 1882, p. 322), nec Bleeker, is perhaps the same fish.

Amphilius atesuensis.

Depth of body 5 to 6 times in total length, length of head 4 to $4\frac{1}{2}$ times. Head a little longer than broad; eyes small, in the middle of the length of the head, $2\frac{1}{2}$ or 3 diameters apart; interocular width $\frac{3}{4}$ length of snout, which is broadly rounded and projects a little beyond lower jaw; posterior nostril a little nearer eye than end of snout, præmaxillary teeth forming a crescentic band; maxillary barbel as long as head or a little longer, outer mandibular a little shorter than head, inner mandibular about $\frac{3}{5}$ length of head. Dorsal I 5–6, equally distant from end of snout and from root of caudal, first ray $\frac{2}{3}$ to $\frac{3}{4}$ length of head. Adipose $\frac{1}{4}$ to $\frac{1}{2}$ longer than dorsal. Anal I 5–6, midway between root of ventral and root of caudal. Pectoral slightly longer than ventral, a little shorter than head. Ventrals below posterior rays of dorsal. Caudal forked, with rounded lobes. Caudal peduncle a little longer than deep. Brown above, speckled with darker, whitish below; six yellowish cross-bars on the back, the first on the nape, the third just behind the dorsal fin; fins whitish, the dorsal with a transverse series of small black spots, the

caudal with a black basal bar and a transverse band of crowded black spots.

Total length 60 mm.

Four specimens from the Atesu River, Gold Coast, from Mr. R. B. N. Walker's collection. These specimens have been recorded by Günther (P. Z. S. 1902, ii. p. 336) under the name of *Amphilius platychir*, Gthr., a species which differs in the ventral fins being some way behind the vertical of the dorsal, which is much nearer the end of the snout than the root of the caudal, in the longer snout, and in the shorter barbels.

Chiloglanis cameronensis.

Body somewhat depressed in front, compressed behind, its depth $4\frac{1}{2}$ to 5 times in the total length. Head depressed, once and $\frac{1}{3}$ as long as broad, its length 3 times in the total length. Eye directed upwards, in second half of head, its diameter 7 or 8 times in length of head, once and $\frac{2}{3}$ in interorbital width, which equals or is a little less than the distance between eye and posterior nostril; præmaxillary teeth in two large oval groups, well separated on the middle line, forming 4 or 5 transverse series; a group of 12 to 14 slender mandibular teeth; maxillary barbel $\frac{1}{4}$ to $\frac{1}{3}$ length of head, longer than the lower labials. Dorsal I 5; spine not serrated, about $\frac{3}{5}$ length of head. Adipose low, its base about $\frac{2}{5}$ its distance from the rayed dorsal. Anal III 5–6. Pectoral spine not serrated, $\frac{2}{3}$ to $\frac{3}{3}$ length of head. Ventral extending to origin of anal or a little beyond. Caudal slightly emarginate. Caudal peduncle once and a half as long as deep. Pale brownish above; head marbled with dark olive and with a chevron-shaped dark band passing through the eyes, the point on the occiput; three broad dark cross-bands on the body, the first behind the dorsal, the second across the base of the adipose fin, the third at the base of the caudal; fins whitish, with a dark band across the caudal.

Total length 50 mm.

Seven specimens from Efulen, South Cameroon, collected by Mr. G. L. Bates.

This species is closely related to *C. modjensis*, Blgr., recently described from Southern Ethiopia, from which it is readily distinguished by the shorter caudal peduncle and the wider interspace between the two groups of præmaxillary teeth.

Chiloglanis Batesii.

Body somewhat depressed in front, compressed behind, its depth 5 to 6 times in the total length. Head depressed, once and $\frac{1}{3}$ as long as broad, its length 3 times in the total length. Eye directed upwards, in second half of head, its diameter 5 times in length of head and equal to interorbital width, which exceeds the distance between the eye and the posterior nostril; præmaxillary teeth in two large oval groups, well separated on the middle line, forming 3 or 4 transverse series; a group of 8 to 12 slender mandibular teeth; maxillary barbel as long as eye, lower labial barbels shorter still. Dorsal I 5; spine not serrated, $\frac{2}{3}$ to $\frac{1}{2}$ length of head. Adipose low, its base barely $\frac{1}{2}$ its distance from the rayed dorsal. Anal III 5. Pectoral spine not serrated, about $\frac{1}{2}$ length of head. Ventral extending beyond origin of anal. Caudal deeply forked, upper lobe more or less produced. Caudal peduncle twice as long as deep. Yellowish brown above, with large dark brown marblings forming more or less regular cross-bands; a black bar at the base of the caudal; lower parts white; fins whitish, lobes of caudal greyish.

Total length 38 mm.

South Cameroon; four specimens from Efulen and one from streams tributary of the Lobi River, 15 or 20 miles S.W. of Efulen. Collected by Mr. G. L. Bates.

Very closely allied to *C. brevibarbis*, Blgr., discovered by Mr. S. L. Hinds in the Kenya district of East Africa; differing in the slightly larger eye, the more numerous mandibular teeth, and the longer ventral fin.

Haplochilus macrurus.

Depth of body equal to length of head, $3\frac{1}{2}$ to 4 times in total length. Upper surface of head flat; snout much shorter than the eye, the diameter of which is about 3 times in length of head; lower jaw projecting beyond upper; interorbital space $\frac{2}{3}$ to $\frac{1}{2}$ length of head. Dorsal 7–8, rounded, originating nearer to root of caudal than to occiput; longest rays $\frac{2}{3}$ to $\frac{3}{4}$ length of head. Anal 12–14, originating at equal distance from eye and from root of caudal; longest rays as long as head. Pectoral nearly $\frac{3}{4}$ length of head, reaching beyond base of ventral. Caudal fin rounded, longer than head. Caudal peduncle a little longer than deep. 24 to 26 scales in a longitudinal series, 6 or 7 in a transverse series. Pale brownish, finely speckled with darker; a fine dark lateral

line; fins uniform greyish; sometimes a dark spot in the axil and another at the base of the ventral fin.

Total length 32 mm.

Several specimens from Marimba, Lake Sarmento, Angola, collected by Dr. W. J. Ansorge.

This species is allied to *H. spilauchen*, A. Dum., but easily distinguished by the shorter snout, the projecting lower jaw, and the larger caudal fin. Secondary sexual characters do not appear to exist.

PROCATOPUS, gen. nov. (Cyprinodontid).

Characters of *Haplochilus*, McClell., but ventral fins far forward, almost below the base of the pectorals, which are inserted very high up the sides.

Procatopus nototœnia.

Body very strongly compressed, its depth equal to length of head and 3 times in total length; upper surface of head and anterior part of back quite flat. Snout as long as eye, the diameter of which is 3 to $3\frac{1}{2}$ times in length of head; lower jaw projecting beyond upper; interorbital width not quite half length of head; sensory canals on upper surface of head very strongly developed. Dorsal 9–11, originating at equal distance from occiput and from root of caudal and above middle of base of anal; posterior ray longest, $\frac{2}{3}$ to $\frac{4}{5}$ length of head. Anal 14–17, longest rays, in third fourth, as long as head or a little shorter. Pectoral about $\frac{3}{4}$ length of head. Ventral of 6 rays, outer produced into a filament, and at least as long as head. Caudal fin truncate, as long as head. Caudal peduncle as long as deep. 25–28 scales in a longitudinal series, 7 or 8 in a transverse series; no lateral line; exposed surface of scales regularly hexagonal, more than twice as deep as long on the middle lateral series. Pale yellowish olive above, yellowish white beneath; a bright yellow streak on each side of the back, from behind the supraciliary edge to the base of the caudal fin, bordering the dorsal fin; an orange streak on the middle of the back, from the occiput to the origin of the dorsal fin; fins greyish, anal and caudal tinged with yellow at the base.

Total length 48 mm.

Southern Cameroon. Numerous specimens were obtained by Mr. G. L. Bates 15 or 20 miles S.W. of Efulen, in streams tributary of the Lobi River, which reaches the sea at Batanga.

IV.—*Descriptions and Records of Bees.*

By T. D. A. Cockerell.

Exomalopsis verbesinæ, sp. n.

♀.—Length hardly 7 mm.

Black, with yellowish-white pubescence, snow-white on sides of face; a few dusky hairs fringing the median bare area on thorax; vertex shining, impunctate; clypeus with a few large punctures, its anterior edge narrowly reddish; mandibles with a red spot on middle; flagellum bright ferruginous beneath except at base, and also above at apex, the last joint with a shining oblique truncation; scutellum anteriorly bare, posteriorly with a very heavy fringe of hair, which intrudes on the middle of the postscutellum; tegulæ hairy, very dark brownish; wings clear, slightly milky, nervures and stigma piceous, stigma short, venation as in *E. solani*; legs black, the tarsi becoming ferruginous, the small joints bright red, with black claws; scopa of hind legs very long, yellowish white, fulvous on inner side of tarsi; abdomen shining, segments 2 and 3 with narrow but very conspicuous pure white marginal hair-bands; a very short line of the same character is on each side of the first segment; bases of third and fourth segments broadly seal-brown; apical segments with a good deal of white hair; venter rather bright ferruginous.

Hab. Mesilla Park, New Mexico, at flowers of *Verbesina exauriculata*, June 19 (*Clarence Rhodes*).

The anterior declivity of the first abdominal segment is bounded by a strong rim. The species probably belongs to the group *Anthophorula*, and will have a yellow or white clypeus in the male. It is allied to *E.* (*Anthophorula*) *Bruneri*, Crawf., which visits *Helianthus* in Nebraska. The date, June 19, seems early, but I suppose I rightly interpret the figures "19 6" written by Mr. Rhodes on the label.

Anthophora sp.

From the nests of a species of *Anthophora* (the bees not seen) my wife took a living specimen of the remarkable Meloid beetle *Hornia minutipennis*, Riley, at Colorado Springs, Colorado, in May.

Melissodes machærantheræ, sp. n.

♂.—Length almost 15 mm.

Black, with white to yellowish-white pubescence, nowhere

mixed with black or fuscous; eyes (when dry) light greenish yellow; facial quadrangle much longer than broad; clypeus (except the usual lateral spots), labrum (except an elongate median black mark), and a spot at base of mandibles light yellow; mandibles mainly ferruginous; vertex seen from in front moderately elevated; hair of occiput very long, abundant, and white; antennæ reaching to base of abdomen, scape pubescent, flagellum dull ferruginous beneath, except first and basal half of second joint; flagellar joints above with their apical margins very narrowly white-ringed; fourth antennal joint much longer than fifth; hair of thorax dull white; mesothorax dull, very densely malleate rather than punctured; tegulæ dark orange-ferruginous; wings with a yellowish tinge, slightly dusky on apical margin; nervures dark ferruginous; legs black, with white hair, small joints of tarsi ferruginous, hair on inner side of basal joints of tarsi orange; abdomen very dark brown, with the bases of the segments becoming black and their hind margins pallid, the pubescence white (pale yellowish on last segment), forming more or less distinct bands on the third to fifth segments; subapical lateral spines large, apical plate broad; venter hairy.

Hab. At flowers of a tall species of *Machæranthera*, near the White Sands, New Mexico, Sept. 30, two males (*Cockerell*); Buckeye, Arizona, at flowers of *Cucurbita palmata*, one male (*Cockerell*).

Larger than the male of *M. obliqua*, with the fourth antennal joint longer and the notches at the sides of the apical plate of the abdomen (so conspicuous in *obliqua*) barely indicated. The size agrees with *M. Townsendi*, which has the pubescence quite different; the underside of the flagellum a very lively (instead of dull) ferruginous, which extends to the extreme base; and the apical plate very hairy, with a strong black rim which is not in the least notched. The wholly pale hair of the ventral surface of the abdomen separates it at once from *M. comanche*, Cresson, and the longer antennæ from *M. texana*, Cresson.

While on *Melissodes*, it is desirable to mention that Mr. Viereck has examined Cresson's types of *M. bituberculata*, *M. afflicta*, and *M. Sumichrastii*, and finds that all three belong to the genus *Diadasia*. *M. toluca* and *M. apacha* have been already referred to *Diadasia* by Mr. Fox.

A female *Melissodes* from Phœnix, Arizona, Oct. 15, at flowers of *Helianthus annuus*, is apparently the female of *M. machæranthera*. It has the general build of ♀ *M. obliqua*,

but has the femora, the ventral surface of the abdomen basally, and the thorax below the wings bright ferruginous, while the clypeus, scutellum, metathorax, basal part of first abdominal segment, &c. are dull red. The hair on inner side of hind tibiæ and tarsi is light ferruginous. The antennæ are as in *M. obliqua*, but clearer red, and the wings are hardly so dark.

Melecta interrupta, Cresson.

This insect occurs in New Mexico in two varieties, which may possibly prove to be distinct species. Unfortunately the species is rare, and only a few specimens have been collected. As the New Mexico varieties do not precisely agree with the typical form from Texas, they are herewith described:—

Var. *fallugiæ*.

Pubescent markings bright orange-fulvous (pale ochraceous or tawny in the type); mesothorax extremely densely punctured, so as to be dull; the most distal point of third submarginal cell not much above its middle.

Pecos, N. M., June 27, at flowers of *Fallugia*, 1 ♀ (*M. Grabham*); Continental Divide, La Tenaja, N. M., Aug. 2, 1 ♀ (*C. H. T. Townsend*).

Var. *rociadensis*.

Pubescent markings pale ochraceous, those on abdomen white shaded with ochraceous; disk of mesothorax with the punctures well separated, showing the shining surface between; the most distal point of third submarginal cell conspicuously above its middle. Looks like a large *M. miranda*, but easily distinguished by the dark wings and tegulæ and the shape of the abdominal markings.

Rociada, N. M., Aug. 10, 1 ♂ (*Cockerell*).

Melipona ligata, Say.

San Rafael, State of Vera Cruz, Mexico, middle of July, at flowers of plant no. 31 (*Cordia* sp., probably *C. ferruginea*). Collected by Prof. C. H. T. Townsend.

Eulema surinamensis (L.).

Vicinity of San Rafael, State of Vera Cruz, Mexico, March 23 and 26, at flowers of plants nos. 14 and 21 (*C. H. T. Townsend*).

Exomalopsis mellipes, Cresson.

San Rafael, State of Vera Cruz, Mexico, at flowers of plant no. 31 (*Cordia* sp., probably *C. ferruginea*), middle of July (*C. H. T. Townsend*).

Epeolus Martini (Ckll.).

Epeolus remiyatus, var. *Martini*, Ckll. Canad. Entom. xxxii. p. 362 (1900).

In the collection of the Colorado Agricultural Experiment Station are specimens taken in Colorado; and after studying them, I feel satisfied that they represent a valid species.

Xenoglossodes imitatrix, Ckll. & Porter.

Glorieta, New Mexico, Aug. 16, 1903, 1 ♀ (*W. P. Cockerell*).

The specimen has a red stripe on the mandibles.

Diadasia rinconis, Ckll.

Pecos, New Mexico, Aug. 4, 1903, 1 ♀ at flowers of *Opuntia arborescens*.

Lithurgopsis apicalis (Cresson).

Pecos, N. M., Aug. 4, 1903, 1 ♂ at flowers of *Opuntia arborescens*.

The first recurrent nervure enters the second submarginal cell at its extreme basal corner; in some specimens of this species it enters some little distance from the base.

Euglossa cordata (L.), var. *Townsendi*, nov.

Hair of vertex and dorsum of thorax nearly all black; a band of black hairs (conspicuous in lateral view) from eye to eye in front of ocelli; hair of occiput and cheeks white, with a slight yellowish tint; wings strongly dusky. Disk of clypeus in male brilliant purple.

Hab. Vicinity of San Rafael, State of Vera Cruz, Mexico, ♂, March 12, "in nest"; females with the same data (*C. H. T. Townsend*).

Perhaps a distinct species.

Anthophora euops, Ckll.

Prospect Lake, Colorado Springs, Colo., at flowers of *Aragallus Lamberti*, May 22, 1 ♂ (*T. & W. Ckll.*).

In fresh specimens the mesothorax is densely covered with greyish-white hair, strongly mixed with black.

Synhalonia frater (Cress.), subsp. *aragalli*, nov.

♀.—Mandibles entirely black; eyes in life black; light parts of abdominal bands very pale ochraceous (not white or ashy); shining hind margins of first two segments narrower, and that on third reduced to an extremely narrow streak; dark apical hairs sooty or seal-brown (not at all ferruginous); last ventral hair-band deep strong ferruginous, edged with whitish.

Hab. Prospect Lake, Colorado Springs, Colo., at flowers of *Aragallus Lamberti*, May 22 (*T. & W. Ckll.*).

Synhalonia crenulaticornis (Ckll), subsp. *lippiæ*, nov.

♂.—Averaging perhaps slightly larger; clypeus yellow, except the broad hind border, the upper margin of the yellow therefore with a pyramidal outline; fourth antennal joint averaging longer.

Hab. La Cueva, Organ Mts., N. M., prox. 5300 feet, at flowers of *Lippia Wrightii*, Sept. 5 (*C. H. T. Townsend*); also three collected by Prof. Townsend at Dripping Spring, Organ Mts., N. M., Aug. 10.

Easily known by the large amount of yellow on the clypeus; the middle part of the labrum is also yellow, whereas in true *crenulaticornis* the whole labrum is black.

Sphecodes pecosensis, Ckll.

Cheyenne Cañon, Colorado, at flowers of *Prunus*, May 18, 1904, 2 ♀ (*W. P. Cockerell*).

New to Colorado. The specimens are a little larger than the type. The hair at the end of the abdomen is sooty, and there is a deep constriction between the first two dorsal abdominal segments.

Agapostemon viridulus (Fabr.).

Colorado Springs, Colo., at flowers of *Taraxacum taraxacum*, 1 ♀, May 10 (*W. P. Cockerell*).

Heriades gracilior, Ckll.

Heriades gracilior, Ckll. Ann. & Mag. Nat. Hist., Aug. 1897, p. 138.
? *Trypetes barbatus*, Robertson, Trans. Amer. Ent. Soc. xxix. (1903) p. 171.

Females from Las Vegas, New Mexico, at flowers of *Convolvulus arvensis*, June 17 (*Cockerell*), and Pecos, N. M., July 15 (*W. P. Cockerell*), agree with *H. gracilior*, but also

agree with Robertson's very brief description of his *barbatus*. I do not positively assert that the species are the same, not having compared specimens.

Prosopis.

At Pecos, New Mexico, June 9, 1903, I collected at flowers of *Salix* four males, which prove to be two *P. mesillæ*, Ckll., and one each of *P. divergens*, Ckll., and *P. asinina*, Ckll. & Casad. *P. divergens* is new to New Mexico; the specimen has clearer wings than the type.

Pseudopanurgus, Ckll., 1897.

Protandrenopsis, Crawford, 1903, is the same genus. *P. fraterculus* (Ckll.) is apparently a valid species, and not a synonym of *rugosus* as asserted by Robertson.

Pseudopanurgus pectidellus, sp. n.

♀.—Length slightly over 7 mm.

Similar to *P. fraterculus*, but differing as follows:—Facial foveæ longer and less divergent from the eye-margin above; tips of antennæ bright ferruginous; vertex very closely punctured all over, without tubercles, but with the sides faintly elevated; mesothorax narrower, much more closely punctured; wings much paler, strongly dusky only at apex; stigma smaller; the very short basal enclosure of metathorax strongly transversely ridged, with the area below it strongly shining; abdomen not so broad. From *P. mexicanus* (Cresson) it differs by having the abdomen hairy only at the extreme apex; from *P. scaber* (Fox) by having the clypeus densely punctured all over, without a central line, the dorsulum closely punctured, &c. The tegulæ have a dark reddish spot, and the hind border of the prothorax and tubercles are margined with short but dense white pile. The labrum is shining, with a delicate longitudinal keel.

Hab. Soledad Cañon, Organ Mts., New Mexico, at flowers of *Lectis papposa*, 3 ♀, Aug. 15 (*C. H. T. Townsend*). They were taken in company with *Perdita solitaria*, Ckll.

Andrena Vierecki, sp. n.

♀.—Length about 10 mm.

Black, with ochraceous pubescence; antennæ wholly black, joint 3 about as long as 4+5; base of antennæ surrounded with long ochreous hair; clypeus exposed, shining, strongly but not very densely punctured, with a faint median ridge;

mandibles black, the extreme tip faintly reddish; process of labrum with a concave truncation; facial foveæ broad but short, going little below level of antennæ and not departing from orbital margin; thorax with abundant erect hair, pale fulvous dorsally, with no black intermixed; mesothorax dull and microscopically tessellate, with minute scattered punctures; enclosure of metathorax minutely roughened, scarcely defined except by absence of pubescence; legs black, scopa on hind femora and tibiæ abundant and dense, hind knees with a fringe of sooty hairs; hair on inner side of basal joint of hind tarsi pale; tegulæ shining very dark brown; wings strongly yellowish, greyish at apex; stigma and nervures yellowish ferruginous, second submarginal cell much broader above than third; abdomen broad, minutely roughened, not punctate, with dense ochreous hair-bands on hind margins of segments 2 to 4, that on 2 broadly interrupted in the middle; apical fringe rather pale sooty. In Robertson's tables runs to *A. salicis*, but is quite distinct from that by the short facial foveæ and dense abdominal bands.

Hab. Colorado Springs, Colorado, April 22, at female flowers of *Salix*, collected by W. P. Cockerell.

Named after Mr. H. L. Viereck, who is doing such excellent work on *Andrena*. Mr. Viereck tells me that *A. Viereckii* is allied to *A. pacta*, Vier., but it has the dorsulum dull (shining in *pacta*) and the fimbria dusky (ochreous in *pacta*).

Andrena leptanthi, Viereck & Cockerell, sp. n.

♂.—Length about 9 mm.

Black, with long ochraceous pubescence; clypeus smooth and shining, with sparse shallow punctures, not concealed by hair, *bright lemon-yellow*, except the narrow anterior margin and the usual two spots, which are broadly V-shaped; facial quadrangle broader than long; clypeus much produced; malar space very large, almost square; mandibles black, faintly reddish at apex, very long and curved, with a short inner tooth; process of labrum rather broadly truncate, the corners rounded; antennæ long, black, faintly brownish beneath, joint 3 perhaps a trifle longer than 4+5; cheeks broad, the sides of the head behind produced into prominent angles about level with the middle of the upper half of the eye; mesothorax rather shining, with distinct but sparse punctures; enclosure of metathorax small, without a rim, minutely rugose, with a slight tendency to wrinkling; legs, including tarsi, black, with reddish-ochreous hair; tegulæ dark; wings slightly greyish, strongly so at apex; stigma

brownish ferruginous, nervures dark brown; second submarginal cell very little broader above than third; basal nervure passing a short distance basad of transverso-medial; abdomen shining, impunctate, thinly hairy, with longer hair on first two segments. Related to *A. bipunctata*, Cress., and *A. trevoris*, Ckll., but very distinct.

Hab. Maniton, Colorado, 6630 feet, April 28, 1904, at flowers of *Ribes leptanthum*. Collected by T. D. A. and W. P. Cockerell.

Mr. Viereck writes:—"Represented in coll. Am. Ent. Soc. by 3 ♀ and 4 ♂ from Nevada: the ♀ is covered all over with brown pubescence and has a variable yellow spot on the clypeus; this yellow spot is only faintly indicated in one specimen." The species belongs to a group consisting of *A. leptanthi*, *A. Porterœ*, and a new species from New Jersey and Connecticut which will be published by Mr. Viereck.

Andrena Porterœ, Ckll.

This black species is new to Colorado. Maniton, April 28, at flowers of *Ribes leptanthum*, 2 ♀; Cheyenne Cañon, Colo., at *Ribes leptanthum*, May 11, 1 ♀ collected by Miss Winifred M. Shumway; Roswell, Colo., at *Ribes longiflorum*, May 14, 1 ♀ collected by W. P. Cockerell.

Andrena erythrogastra (Ashmead).

Colorado Springs, Colo., at female flowers of *Salix*, May 10, 1 ♀ (*W. P. Cockerell*); Prospect Lake, Colorado Springs, at *Salix*, May 22 (*T. & W. Ckll.*).

Nomada suavis, Cresson.

Palo Alto, California, Aug. 16, 1895 (*V. L. Kellogg*).

Nomada ultima, Ckll.

Palo Alto, California, April 6, 1892 (*V. L. Kellogg*). New to California.

Nomada fragilis, Cresson.

Halfway House, Pike's Peak, Colorado, about 8900 feet, at flowers of *Salix*, May 30, 1 ♂ (*Cockerell*).

Nomada Frieseana, sp. n.

♀.—Length about 9 mm.

Just like *N. rubicunda* of the Atlantic seaboard, except for

the following characters:—Third antennal joint much shorter, being hardly longer than its apical breadth; fourth also shorter; flagellum amber-coloured on both sides, though darker above; wings without the yellow shade; scutellum and axillæ of the same red colour as the mesothorax; hind femora without a black stain in front, though there is one behind; second abdominal segment with a large pyriform white mark on each side; the white on segments 2 to 5 interrupted sublaterally, 5 with a good deal of red; apical ventral bristles largely pale.

Hab. Prospect Lake, Colorado Springs, Colorado, May 22, 1904 (*T. & W. Ckll.*).

Named after the greatest living authority on Apoidea.

Nomada semiscita, sp. n.

♂.—Length 7⅔ mm.

Runs in my tables to *N. scitiformis* and has no supraclypeal mark, but differs thus:—Face-marks lighter yellow; lateral marks larger, reaching to the level of the antennæ; fourth antennal joint shorter, not much longer than fifth; pubescence of thorax &c. white, not at all yellow; basal nervure meeting transverso-medial; spine of anterior coxa short and red; abdominal markings very pale yellow on first segment, bluish white on the others; apical plate dark red (black in *scitiformis*).

Hab. Prospect Lake, Colorado Springs, Colorado, May 22, 1904 (*T. & W. Ckll.*). At flowers of a *Senecio* of the group *S. aureus*.

Although this and the last were taken at the same time and place, I do not feel at liberty to consider them sexes of one species. Not only do the tegulæ differ in colour (bright ferruginous in *Frieseana*, pale yellow in *semiscita*), but the third submarginal cell in *semiscita* has a small appendicular nervure, wholly wanting in *Frieseana* and *scitiformis*. In life the eyes of *Frieseana* ♀ are pale red, of *semiscita* ♂ pale yellowish green.

Xylocopa nautlana, sp. n.

♀.—Length about 30 mm.

Similar to *X. morio* (Fabr.), with the same shining black body, black pubescence, and brown-black wings with a strong purple iridescence. The labrum has the same three protuberances, the clypeus has the same structure, and the punctuation is about the same. The second abdominal segment has very numerous, small, feebly-impressed punctures, whereas in *morio* it is smooth, with scattered, mostly

rather strong, punctures. The ridge in front of the ocelli is very strong, forming a double arch, without any prominent lateral eminences. The deep space under this ridge is filled with pollen, for what reason I do not know. In *morio* the ridge is not so strong and in the middle it sends downwards a process which encloses the middle ocellus, which is not at all the case in *nautlana*. There is a tuft of dark reddish hair at the apex of the abdomen, almost hidden amongst the black. Hind tibiæ with two teeth (side by side) on the middle of the outer side.

Hab. Rio Nautla, in the neighbourhood of San Rafael, State of Vera Cruz, Mexico, March 18. At flowers of plant no. 18 (*C. H. T. Townsend*).

Xylocopa brasilianorum (L.).

Vicinity of San Rafael, Vera Cruz, Mexico, March 18, at flowers of plant no. 18 (*C. H. T. Townsend*).

The hind tibiæ have on the outer face an oblique keel ending in two low but broad teeth; the prominence between the antennæ is quite large.

Xylocopa colona, Lep.

Vicinity of San Rafael, Vera Cruz, Mexico, ♀ March 23, at flowers of plant no. 21; males March 23 and 30 (*C. H. T. Townsend*).

The female is easily known from *brasilianorum* by its smaller size, more closely punctured abdomen, and shorter third antennal joint. The male, which Smith described as *X. erratica*, has an extremely strong superficial resemblance to *X. collaris*, Lep., from the Khasia Hills, India. The form of male *collaris* which thus resembles *erratica* is the variety mentioned by Bingham (Hymenop. Brit. India, p. 543), in which the whole thorax is covered with ochraceous pubescence, and the third abdominal segment is provided with an ochraceous down like the second. This variety, which may be called var. *Binghami*, I have received from Mr. Sladen.

V.—*On the Coleopterous Group "Heptaphyllini" of De Borre.* By Gilbert J. Arrow, F.E.S.

In the monographic Catalogue of the Trogidæ, published in 1886 by M. Preudhomme de Borre, that family is divided into five sections, one of which, the Heptaphyllini, was created

for a single species, unknown to the author, but characterized by the possession of tarsi with only four joints, a phenomenon unknown in any other Lamellicorn beetle. Referring to the original description by Friedenreich of this anomalous beetle, in the 'Stettiner entomologische Zeitschrift' for 1883 (p. 375), I was glad to find not only the beetle but also its larva described in detail. Many of the characteristics of both, however, are such that I have no hesitation in rejecting the insect, not only from the Trogidæ, but from the Lamellicorn suborder. *Heptaphylla fungicola*, Fried., is a minute beetle found in fungi in Brazil. It is 2½ mm. long, and has antennæ of 11 joints, of which 7 are lamellate. The right mandible is simple and acutely pointed, while the left is strongly bifid. These, as well as its other structural features, unmistakably identify it with the genus *Rhipidandrus*, Leconte (*Eutomus*, Lacordaire), belonging to the Malacodermatous family Cioidæ. The species hitherto placed in this genus range from the United States of America to the northern part of South America, and Friedenreich's insect may be regarded as another species extending this range farther southward. The genus was characterized by Lacordaire under the name of *Eutomus* in 1866; but Leconte's name, although stated by Fleutiaux and Sallé to be of later date, was really published by him in 1862 in part 1 of his 'Classification of the Coleoptera of North America' (p. 236). The claim of the name *Rhipidandrus* over the other two is therefore indisputable. A second genus, *Cherostus*, has been created by Mr. Waterhouse for two Old-World forms very nearly related to the American insects. They have the lamellæ of the antennal club much shorter, and all the tibiæ are armed with spines at their ends. Lacordaire's species, *Rhipidandrus micrographus*, which was described from northern South America, has been recorded from Guadeloupe and St. Vincent. I have seen no specimens from the former island, but those from the latter, which are in the British Museum, do not agree with Lacordaire's description, all the tibiæ having spinose prolongations, while the antennæ have the first joint quite short, instead of reaching to the middle of the eye, and the lamellæ quite short. It therefore agrees better with *Cherostus*, and I propose to call it

Cherostus cornutus, sp. n.

Breviter cylindricus, piceus, clypeo pedibusque rufis, antennis testaceis, clypeo lævi, nitido, fronte grosse, haud profunde, sed creberrime punctata, medio late impresso, fœminæ depressione breviter

æqualiter fulvo-hirta, maris clypeo breviter bicornuto, tuberculis duobus minutis intra oculos; prothorace ubique grosse et densissime punctato, antice et postice excurvato, angulis anticis obsoletis, posticis obtusis; elytris acute costatis, interstitiis opacis, vix perspicue transverse plicatis.
Long. 4·5 mm.

Hab. St. Vincent (Leeward side); Grenada (Grand Étang, 1900 feet).

This, the largest yet known of these species, was found by Mr. H. H. Smith in Boleti. There is a single female specimen in the Museum of a closely related species from Jamaica which it is perhaps desirable to describe here.

Cherostus jamaicensis, sp. n.

Cylindricus, ferrugineus, antennis testaceis, capite grosse, haud profunde sed creberrime punctato, leviter longitudinaliter impresso, depressione (♀) brevissime fulvo-pilosa, clypeo medio lævi; prothorace grosse et densissime punctato, antice et postice excurvato, angulis anticis obsoletis, posticis obtusis; elytris acute costatis, interstitiis transverse plicatis.
Long. 3 mm.

Hab. Jamaica (Kingston).

This is a smaller and narrower insect than those before described. The elytral interstices are more rugose and the pubescence upon the head of our specimen is extremely fine.

Yet another species to be placed here is *Xyloborus crenipennis* of Motschulsky, of which the tarsi were erroneously believed by him to be heteromerous. This was recorded from Burma by the describer, but typical specimens in our collection received from him are (perhaps wrongly) supposed to have been brought from Ceylon. There are also examples from the Andaman Islands. This species is most nearly related to the Australian form, *C. Simpsoni*, Waterh., but is smaller, narrower, and of a uniform brick-red colour. There is a smooth space upon the front of the head placed longitudinally, whereas a similar patch in *C. Simpsoni* is transverse. The typical species, *C. Walkeri*, of which the original specimens were brought from Damma Island, also exists in the island of Matabello.

The generic classification of these peculiar little beetles can only be regarded as provisional until our knowledge of them has become more complete. The hairy fringe upon the head may, perhaps, be found to constitute an important sectional distinction. This, as I have indicated, is a peculiarity of the female sex. It does not appear to occur in all

the species; but, as no attention has been paid to the sexual characteristics in the species hitherto described and few species have been recognized, it may be more general than appears. I have found it only in *Cherostus Walkeri*, *cornutus*, and *jamaicensis*. The importance of the tibial prolongations is also at present uncertain. Lacordaire's second species, *Eutomus madagascariensis*, is said to bear these on the middle legs only, for which reason he regarded it as forming a distinct section of his genus. This may necessitate the formation of a third genus if the feature is found to have the importance attached to it by him.

The description of the larva of *Rhipidandrus fungicola* by Friedenreich is interesting, in view of the extremely divergent views which have been held as to the proper location of the group. The body is bent like that of most Lamellicornia, but there are only nine abdominal segments, which are not larger than the thoracic, and the terminal one ends in a pair of pointed processes. There are five ocelli on each side of the head, and the labial palpi are said to be three-jointed. All these characteristics exclude the insect from the ranks of the Lamellicorn Coleoptera and conclusively point to its relationship to the lignivorous Malacodermata. This additional light is of value in settling the question as to the true systematic position of an enigmatical type of insect which has been referred to no less than four of the suborders of Coleoptera.

The "Heptaphyllini" being eliminated, it remains true for the Lamellicornia that a primitive five-jointed tarsus is the most invariable of their characteristics, probably the only exception being a very few obviously degenerate forms such as *Stenosternus* and *Phycochus*, which are among the most abnormal of all Coleoptera.

VI.—*New* Sciurus, Rhipidomys, Sylvilagus, *and* Caluromys *from Venezuela.* By Oldfield Thomas.

Sciurus flammifer, sp. n.

A very large species allied to *S. igniventris*. Belly white. Tail ochraceous. General colour of body above of the same speckled or grizzled yellowish as in *S. igniventris*. Head and ears rufous. Chin pale rufous. Rest of underside and inner sides of limbs pure sharply defined white, edged on each side with a narrow line of orange-rufous. Outer side of limbs rich rufous, becoming orange-rufous on the digits.

Tail long, not so bushy as in some members of the group, its hairs for the proximal six inches ringed basally with black and dull yellow, with broad flaming orange tips, which gradually spread downwards till on the terminal half of the tail the hairs are wholly orange to their bases. Mammæ 8.

Skull stout and heavy, its muzzle not abnormally narrow.

Dimensions of the type (measured in the flesh) :—

Head and body 285 mm.; tail 313; hind foot, s. u. 65, c. u. 70; ear 31.

Skull: greatest length 68; basilar length 53; zygomatic breadth 40; nasals 21 × 10·5; interorbital breadth 23; palate length 29·5; length of upper tooth-series 10·1.

Hab. La Union, Caura district, Lower Orinoco.

Type. Female. B.M. no. 4. 5. 7. 28. Original number 308. Collected 24th October, 1902, by Mr. S. M. Klages. Presented by Oldfield Thomas. One specimen in normal pelage, and a second, presumably the same, showing a partially melanoid condition, with blackish tail and black belly.

This fine squirrel is most closely allied to *S. igniventris* (type locality Marabitanas, Rio Negro), but differs by its pure white instead of bright red under surface and by the wholly orange-red colour of the terminal half of the tail. The latter character will also distinguish it from the geographically more distant *S. tricolor* and *S. castus*, the only other white-bellied members of the group. *S. igniventris tædifer* (Upper Rio Meta), with a somewhat similar tail, has, like its typical subspecies, a wholly red belly.

Rhipidomys venezuelæ fervidus, subsp. n.

Stronger coloured and with smaller teeth than true *R. venezuelæ*.

General colour above uniform rich fulvous (near "tawny ochraceous"); under surface pure sharply defined white. Outer side of limbs like body, inner sides white; hands buffy white, with a slight touch of brown on the metacarpus; feet similar, but the centre of the metatarsus more decidedly brown. Tail uniformly brown, hairy and pencilled terminally as usual.

Skull very similar to that of true *venezuelæ*, but the interparietal shorter antero-posteriorly and the palatal foramina rather longer, extending fully to the level of the front edge of m^1. Teeth as usual, but decidedly smaller than in the typical form.

Dimensions of the type (measured in skin) :—

Head and body 130 mm.; tail 135; hind foot (wet) (s. u.) 27; ear 17.

Skull: greatest length 32·5; basilar length 26; interorbital breadth 5·5; interparietal 4·7 × 9·7; palate length 13; diastema 8·5; palatal foramina 7; length of upper molar series 4·5.

Hab. La Union, Lower Orinoco.

Type. Male. B.M. no. 4. 5. 7. 34. Original number 305. Collected 23rd October, 1902, by Mr. S. M. Klages. Two specimens, adult and immature.

The large number of the common *R. venezuelæ* of Merida with which I have been able to compare this animal agree in the uniformly larger size of their molars, and also average much paler in colour.

Rhipidomys rosilla, sp. n.

A small rufous species allied to *R. dryas*, Thos.

Size about as in *R. dryas*, or slightly larger. Fur close, straight, and crisp, hairs of back scarcely more than 5 mm. in length. General colour above rich tawny, the crown and anterior back more greyish and heavily lined with black, the rump and hips deep uniform tawny. Throat and chest white. Belly buffy ochraceous, paler mesially, an area of richer ochraceous tawny edging the darker colour of the sides; but there is no sharp line of demarcation. Inguinal region and inner side of hind limbs white. Ears of medium size, brown. Upper surface of hands and feet dull buffy white. Tail rather short for this genus; uniformly brown, well-haired, pencilled terminally.

Skull very much as in *R. dryas*, the palatal foramina rather larger.

Dimensions of the type (measured on the dry skin):—

Head and body 109 mm.; tail 101; hind foot (s. u.) 20·5; ear 13·5.

Skull: greatest length 28; basilar length 21·3; zygomatic breadth 15·5; nasals 9; interorbital breadth 5; breadth of brain-case 12·8; palate length 11·7; diastema 7·4; palatal foramina 5·4; length of upper molar series 3·8.

Hab. La Union, Lower Orinoco.

Type. Old male. B.M. no. 4. 5. 7. 37. Original number 310. Collected 26th October by Mr. S. M. Klages. Two specimens.

This pretty species is readily distinguishable by its small size and rich colour. Its only near ally, *R. dryas*, from Ecuador, has the belly pure white, without any trace of the unusual ochraceous suffusion characteristic of the present animal.

Sylvilagus meridensis, sp. n.

A small dark-coloured species allied to *S. andinus*.

General appearance very much as in *S. andinus*, the dorsal colour rather darker (approaching "olive"); a warmer brown tone along the middle of the back. Fur longer throughout. Frontal region like back; cheeks similar, but greyer, without prominent markings; hinder part of orbit inconspicuously lighter. Ears very short, their basal third furry like the head; front part of outer surface brown; inner surface dull buffy. Nape dull greyish rufous, but little contrasted with the general colour. Under surface dull soiled buffy, not sharply defined laterally, the ends of the belly-hairs, especially in the inguinal region, dull buffy, with the grey bases showing through. Arms dull tawny outside, the hands richer tawny, but changing occasionally into white on the digits; inner aspect of arms dull buffy. Hind limbs similar, the rump and legs scarcely more rufous than the back, the feet dull tawny. Tail quite minute, coloured like the body, rather blacker above.

Approximate dimensions of the type (from skin):—

Head and body 350 mm.; tail 10 (?); hind foot (s. u.) (wet) 72; ear (wet) 50.

Hab. Sierra de Merida, Venezuela.

Type. B.M. no. 4. 5. 14. 1. Collected by S. Briceño and presented by Oldfield Thomas. Two specimens.

This little hare, or "rabbit" as it would be called in America, is closely allied to the *S. andinus* of the Ecuadorean Andes, but differs by its rather darker general colour, its soiled buffy instead of nearly white belly and hind feet, and the absence of any tawny suffusion on the rump and hind legs.

Young specimens of *S. meridensis* were received some years ago, and I was enabled to mention the occurrence of a species of this group in the Sierra de Merida; but the present are the first adults that have been obtained, and even now, unfortunately, no skulls have been sent with them. The cranial characters are, however, no doubt very much as in *S. andinus*.

Caluromys trinitatis leucurus, subsp. n.

Size as in *C. trinitatis* and *C. t. venezuelæ*, therefore far smaller than in *C. philander*. Fur close and velvety, the hairs of the back only about 9 mm. in length. General colour of the same dull tone as in *venezuelæ*, near "clay-colour," the crown more rufous. Face grey, the dark median line unusually prominent. Under surface and inner side of limbs pale buffy, the dark of the sides encroaching on the

belly-colour, as in *trinitatis*. Tail, apart from the furry basal portion (which is like the back), wholly white, or with a few inconspicuous dark marblings near its base.

Dimensions of the type (measured on the skin) :—

Head and body 210 mm.; tail 300; hind foot (s. u.) 32; ear 32.

Skull: greatest length 48; basal length 44; zygomatic breadth 27·5; combined length of three anterior molariform teeth 7·1.

Hab. Maripa, Caura Valley, Lower Orinoco.

Type. Adult male. B.M. no. 4. 5. 7. 42. Original number 376. Collected 26th October, 1903, by Mr. S. M. Klages.

This opossum agrees in size with the Trinidadian *C. trinitatis* and its Venezuelan relative *C. t. venezuelæ*, and is therefore far smaller than the Guianan *C. philander*, L., to which, however, it shows some affinity by its white tail, *trinitatis* and *venezuelæ* both having this organ brown, with at most a few lighter marblings. Its short close fur will also distinguish it from its Venezuelan neighbour.

VII.—*On the Fishes taken by the 'Oceana.'* *

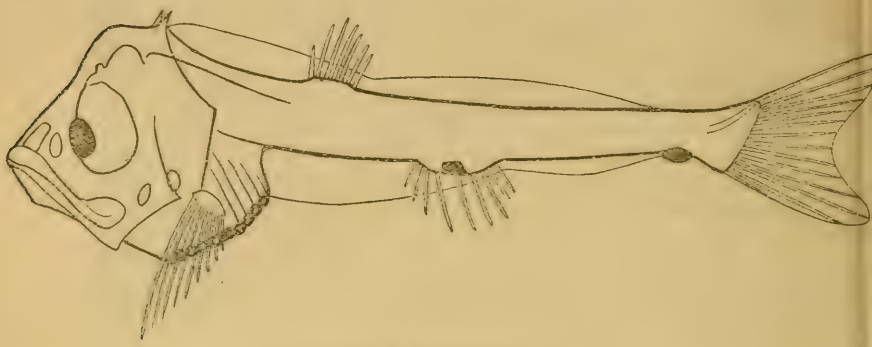
By E. W. L. Holt and L. W. Byrne.

Only six specimens of fish, all very young, were received from the 'Oceana,' viz. :—

	Length.	Station.	
Sternoptychidæ.			
Argyropelecus hemigymnus, Cocco..	7·25 mm.	5 *j*	1510–0 fath.
Genostoma microdon, Gthr.	33 mm.	4 *f*	1275–0 fath.
Syngnathidæ.			
Nerophis æquoreus, L.	70 mm.	4 *f*	1275–0 fath.
? Macruridæ.			
? *Macrurus* sp.....	5·5 mm.	5 *d*	950–0 fath.
„ „	5·5 mm.	5 *e*	1070–0 fath.
Pleuronectidæ.			
? *Hippoglossus vulgaris*, Flem.	10·5 mm.	5 *l*	1710–0 fath.

* For details of the voyage and of the method of capture see 'The Geographical Journal,' vol. xiii. (1899) p. 147.

All the hauls above mentioned were made on the 21st November, 1898. Station 4 was in 52° 27·6′ N., 15° 40′ W., and Station 5 in 52° 18·1′ N., 15° 53·9′ W., and both stations were thus within the British Area as defined by Canon Norman.



Argyropelecus hemigymnus. × 16.

Argyropelecus hemigymnus, Cocco.

Probably the most interesting specimen captured by the 'Oceana' is a larva of this species 6·75 mm. in length without the middle caudal rays (which are about ·5 mm. long) and 2·75 mm. from the snout to the anus. A marginal larval fin still persists, but the rays of the unpaired fins of the adult are already well developed; the marked separation between the abdominal and caudal regions, which is characteristic of older specimens, is, even at this age, very noticeable, but the caudal region is proportionately much longer than in the adult.

There are signs of developing photophores on the abdomen in positions which correspond roughly to those occupied by the photophores of the adult, a single large photophore near the middle of the base of the anal fin, and another near the ventral margin of the caudal peduncle. The pectoral fins are well developed and nearly as long as the abdominal portion of the body. There is no sign of any ventral fin.

The net in which this specimen was captured fished from 1510 fathoms to the surface, and it is impossible to draw any conclusions as to the vertical range of the species. The locality in which the 'Oceana' larva was taken is well within the known horizontal range of the species, which has been taken in the Mediterranean and on both sides of the North Atlantic, as far north in the Eastern Atlantic as the

Faroe Channel. It has already been taken in British waters by the 'Flying Fox' (Günther, Ann. & Mag. Nat. Hist. ser. 6, iv. p. 415, 1889).

It seems to us by no means improbable that *A. hemigymnus*, Cocco, may only be the young of *A. Olfersi*, Cuv.; such specimens of the former as we have seen are all smaller than the smallest specimen of the latter of which we can find any record, and the differences relied on to separate the two species—namely, (*a*) the greater length of the caudal region and (*b*) the proportionately longer pectoral fins of *A. hemigymnus*—appear to be characters which may well be only the signs of a transition from such a larva as is now under consideration to the adult *A. Olfersi*. We have not at present access to sufficient material to do more than suggest the possible identity of the two species.

Gonostoma microdon, Günther.

A small *Gonostoma*, 33 mm. in length, although somewhat damaged, may be identified with reasonable certainty as belonging to this species. *G. microdon* has an almost cosmopolitan distribution, and, although it appears to be by no means uncommon in the deeper parts of the North Atlantic, the present record is the first from the British Area. It is impossible to say at what depth the present specimen was taken, as the net containing it fished from 1275 fath. to the surface; its condition suggests that it may have been taken at a considerable depth.

Nerophis æquoreus, L.

A single specimen 70 mm. in length was taken at Station 4*f* in a net which fished from 1275 fathoms to the surface; there is nothing to show at what depth the specimen was taken. Further specimens of this species have been captured in deep water on the Porcupine Bank by the Department of Agriculture for Ireland's S.S. 'Helga,' and in the Bay of Biscay by H.M.S. 'Research,' and we refrain from dealing fully with the question of the occurrence of *N. æquoreus* in deep water until the further material thus obtained has been worked out.

At a length of 70 mm. the young *N. æquoreus* still retains a vestige of pectoral fins; it differs markedly from the adult and resembles a *Syngnathus* in that the longitudinal ridges of the body are well marked and are prolonged into backwardly directed spines at the posterior edge of each body-ring, so that the postanal portion of the body has a serrated appearance. The smooth and rounded appearance of the adult

does not seem to be attained until a length of more than 100 mm. is reached.

The circumstances under which the "Porcupine Bank" adults were captured and the fact that a specimen was found in the stomach of a bottom-haunting fish (*Scyllium canicula*) at the same place indicate that this species may be a normal inhabitant of the bottom at considerable distances from land if not at great depths.

An adult female from that locality is about 20 cm. in length and an ovigerous male measures about 15 cm. It seems to us that they really represent a distinct variety of the species; but beyond the smaller size we can seize on no character susceptible of intelligible diagnosis.

? *Macrurus* sp.

Two considerably damaged larvæ, with the yolk nearly absorbed and the mouth apparently functional, may possibly be Macrurids. Each is about 5·5 mm. in total length and about 1·75 mm. in preanal length; the postanal part of the body is very elongate and slender. Neither is in a condition to admit of a detailed description being given.

? *Hippoglossus vulgaris*, Flem.

A vitelligerous larva, with a total length of 10·5 mm. and a preanal length of 4 mm., appears to be a Pleuronectid; the body-segments cannot be counted with great accuracy, but probably number about forty-eight; the yolk-sac is still very large and the mouth not yet functional. The specimen is somewhat damaged and darkly stained by the preserving medium. The marginal larval fin—whether naturally or otherwise—appears to be much vacuolated, especially dorsally, while the only visible pigment consists of a few stellate chromatophores in the roof of the body-cavity.

If this larva is correctly identified as a Pleuronectid, it can only be attributed to the halibut, both on account of its size and by a process of elimination. We are unaware of any description of a larval halibut* which can be used for purposes of comparison, and our identification must for the present remain tentative only. The specimen is not in a condition to render a detailed description useful.

* We have already (Department of Agriculture for Ireland, Report on Fisheries for 1901, pt. ii. p. 67 [1903]) given our reasons for regarding the larva tentatively attributed to the halibut by Petersen (Rep. Danish Biological Station, iv. p. 130 [1893]) as a young *Pleuronectes cynoglossus*, and we think that the larval forms since described by Kyle (M. B. A. Journal, vi. p. 618 [1903]) as *H. vulgaris* or *P. cynoglossus* are also referable to the latter species.

VIII.—*Descriptions of new Genera and Species of New Zealand Coleoptera.* By Capt. T. Broun, F.E.S.

Group Cnemacanthidæ.

Mecodema læviceps.
—— striatum.
—— Walkeri.

Group Feroniidæ.

Trichosternus Hudsoni.

Genus of doubtful position.

Eupsorus costatus.

Group Pselaphidæ.

Patreus Lewisi.
Euplectus caviceps.
—— sulciceps.

Group Byrrhidæ.

Curimus vestitus.

Group Lucanidæ.

Mitophyllus curvidens.

Group Melolonthidæ.

Mycernus elegans.
Prodontria Lewisii.

Group Dynastidæ.

Pericoptus frontalis.

Group Opatridæ.

Syrphetodes nodosalis.
Paraphylax sternalis.

Group Rhipiphoridæ.

Rhypistena cryptarthra.
—— sulciceps.

Group Otiorhynchidæ.

Cecyropa alternata.
—— discors.
Platyomida brevicornis.
Tigones dispar.
Catoptes vexator.
—— egens.
—— duplex.
Inophlœus sternalis.
—— discrepans.
—— longicornis.

Group Cylindrorhinidæ.

Pparchus Lewisi.
Tocris latirostris.

Group Rhyparosomidæ.

Pachyprypnus modicus.
Clypeorhynchus inophlœoides.
Bæosomus tacitus.

Group Erirhinidæ.

Philacta maculifera.
Oreocharis ferruginea.
—— pullata.

Group Scolopteridæ.

Gonoropterus spinicollis.

Group Cryptorhynchidæ.

Crisius dorsalis.

Group Cossonidæ.

Pentarthrum crassellum.
Hectæus rubidus.

Group Scolytidæ.

Mesoscolytus inurbanus.

Group Lamiidæ.

Somatidia testudo.

Group **Cnemacanthidæ.**

Mecodema læviceps, sp. n.

Robust, nigrescent, slightly shining; labrum, palpi, antennæ, and femora pitchy red, tibiæ and tarsi rufo-piceous.

Head broad, incurved behind the moderately prominent eyes, almost smooth, having only a few feeble rugæ near the eyes; on the epistome there are two long and three short striæ; labrum rounded, slightly emarginate in the middle, with six setigerous punctures. *Antennæ* with the basal four joints glabrous, the remainder are finely punctate, and gradually become more pubescent towards the extremity, the fifth, however, is nearly nude. *Thorax* 3¼ lines in length by 3¾ in breadth, apex slightly incurved, base medially emarginate; its sides are only indistinctly crenate and are nearly straight for two-thirds of their length, they are sinuously narrowed backwards towards the obtuse posterior angles; the lateral margins are distinctly explanate near the anterior angles, and less so near the basal fossæ; these last are of moderate size, but appear flattened close to the cariniform margins; the discoidal furrow does not attain the front or base, and is marked with seven or eight punctures, the largest of these is in front; near each side there are some faint striolæ, and along the base there are some short shallow ones. *Elytra* oblong-oval, each with eight well-marked punctate dorsal striæ, which become irregular behind, the punctures, especially towards the sides, are distinct and close; the three interstices nearest the suture are broad and plane, the others become narrower, so that the eighth is almost cariniform, the marginal punctuation is irregular. *Legs* moderately slender, anterior tibiæ with produced outer angles and stout inner spurs.

Underside shining, rufo-piceous, nearly smooth; on each segment, near the middle, there are two setigerous punctures and a large impression at each side, the terminal, in addition thereto, has four punctures at its extremity.

This species is, no doubt, nearly allied to *M. lucidum*, Castelnau, but the postocular punctuation is absent; it is, moreover, a broader insect. The elytra near the base are much broader: in my specimen of *M. lucidum* they are so narrowed that the shoulders become quite obsolete. The external angle of the front tibia is almost obtuse.

Length 13, breadth 4 lines.

Ida Valley.

One individual from Mr. J. H. Lewis.

Mecodema striatum, sp. n.

Elongate, rather narrow, glossy black, legs nigro-piceous.

Head moderately elongate; between the frontal impressions and each eye there are three coarse rugæ, on the

forehead there are five, some fine punctures occur behind and six larger ones on the labrum; close to each eye there is a large puncture with duplicate setæ; the vertex is smooth. Mandibles stout, elongate, striate. *Eyes* moderately prominent. Antennæ short, their basal four joints glabrous. *Thorax* hardly any broader than long, its sides gently rounded, sinuously narrowed behind, posterior angles not at all projecting, lateral margins crenulate; dorsal groove very distinct and almost touching the basal and apical margins, its surface is almost quite smooth, though a few fine abbreviated striæ may be seen near the front and base, basal foveæ deep and close to the angles. *Elytra* oviform, gradually but considerably narrowed posteriorly, the shoulders, though somewhat narrowed, are evidently broader than the base of the thorax; their sculpture consists of rather deep, quite impunctate striæ, which become confluent towards the extremity; the three interstices, on each, nearest the suture are nearly plane, the others are convex, on the seventh there is one puncture just behind the middle thigh and two or three along the stria outside, the raised space parallel with the side is very smooth, and the common punctiform sculpture of the marginal channel is nearly altogether absent. Anterior *femora* moderately inflated, the outer angle of the tibia prolonged, basal four joints of the tarsus with prominent external angles; intermediate tibiæ scabrous, with slightly produced outer extremity, the posterior simple.

Underside shining black; the head with close undulating sculpture, flanks of prosternum closely punctate; abdomen with fine irregular linear impressions, the apex of the terminal segment has three setigerous punctures on each side of the middle, but the usual pair of punctures on the central portion is wanting.

There is no need for comparison with other species in this instance, as the deep regular impunctate elytral striæ will at once lead to its recognition.

♂. Length 10, breadth $2\frac{3}{4}$ lines.

Puysegur Point.

One example, from Mr. Sandager's collection, was kindly sent to me by Mr. Lewis.

Mecodema Walkeri, sp. n.

Elongate, shining, coppery black; tarsi and palpi piceous, tips of these latter paler.

Head narrower than thorax, with eight longitudinal sulci

on the forehead, near the eyes it is similarly irregularly rugose, with a single setigerous puncture near each eye; on the vertex there are only faint transverse irregular impressions. *Labrum* slightly notched in front and bearing six setæ. *Eyes* prominent. *Antennæ* short, their basal four joints glabrous, the others pubescent. *Thorax* $3\frac{5}{8}$ broad by 3 lines long, widest near the front, rather gradually narrowed backwards, more abruptly near the base, apex subtruncate, base slightly incurved, lateral margins only feebly crenulate, posterior angles obtuse; the basal fossæ are situated close to the sides, but do not reach the hind margin, the discoidal groove is well marked; in front there are some fine longitudinal striæ, and across the disk faint linear impressions. *Elytra* elongate-oval, with rounded shoulders; on each, between the middle and the side, three indistinctly elevated lines occur, the intervening spaces are moderately coarsely and closely punctured and become rugose behind, nearer the smooth flat suture the punctures are finer and irregular, but do not form series or striæ; the lateral sculpture is not coarser than that near the outside of the dorsum. *Legs* moderately slender; anterior *tibiæ* with produced outer angles, intermediate slightly acuminate, the posterior simple. Terminal joint of maxillary palpi rather broader than in *M. sculpturatum.*

Underside glossy black, head with undulating sculpture, the rest of the body nearly smooth. At the extremity of the last segment there are two setigerous punctures on each side of the middle, and, on one side, there is an additional pair, which, however, in my specimen, is wanting on the other side.

♀. Length 13, breadth $4\frac{1}{4}$ lines.

Akaroa.

This may be be placed near *M. alternans* and *M. Suteri*; it is, however, much larger than either of these and differently sculptured. The name of its discoverer, Mr. J. J. Walker, F.L.S., has been attached to the species.

Obs.—At the same time Mr. Walker supplied me with the male of *Trichosternus akaroensis*, which appears to be usually smaller than the other sex, measuring only $10 \times 3\frac{3}{4}$ lines.

Group **Feroniidæ.**

Trichosternus Hudsoni, sp. n.

Oblong, moderately convex, glossy; head and thorax viridescent, elytra sometimes with a coppery hue; legs

nigro-piceous, tarsi and antennæ rufo-piceous, palpi often more rufescent.

Head, including the prominent eyes, as wide as the front of thorax, and, excluding the mandibles, about equalling it in length ; it is quite smooth and bears the usual frontal impressions. *Labrum* subtruncate, with six setigerous punctures across its front margin. *Mandibles* long and robust, the left one strongly curvate at the extremity. *Thorax* $2\frac{1}{4}$ to $2\frac{1}{2}$ lines long by $2\frac{3}{4}$ to 3 in breadth, its apex incurved, base medially emarginate ; the sides are moderately rounded, and are slightly narrowed, yet scarcely sinuate, behind, posterior angles rectangular ; the dorsal groove generally attains the base and apex ; near the latter there is a slight curved transverse impression ; the basal fossæ are large, occasionally there is a slight intervening depression. *Scutellum* striate at base. *Elytra* ovate-oblong, with dentiform shoulders, rather broad but moderately sinuated towards the apices ; their striæ are deep and finely punctured, the sutural interstices are plane, the others convex, on the third there are three punctures, and on the seventh four or five.

Underside shining, black ; the abdomen with fine irregular linear sculpture, the basal segment has two distinct punctures near the middle of the hind margin, and there are four at the extremity of the terminal one.

This is a much smaller and less robust insect than *T. antarcticus*, with simple femora, and the outer angle of the middle tibiæ is not produced. It is distinguished from *T. bucolicus* by its deeper striæ and more convex elytral interstices.

♂. Length 9–$10\frac{1}{2}$, breadth $3\frac{1}{2}$–$3\frac{3}{4}$ lines.

Wellington.

Five specimens, under the number 192, have been received at various times from Mr. J. H. Lewis and Mr. S. V. Hudson. They were all collected in the same locality, and are undoubtedly a distinct local form. The species is named in honour of the gentleman who discovered it.

Genus of doubtful position.

Eupsorus, gen. nov.

Body moderately elongate, rough. *Maxillary palpi* elongate, basal joint short, the next long and gradually incrassate, third almost transverse, fourth slender and acuminate, as long as the preceding two combined. *Antennæ* inserted below the lateral margins of the forehead,

slender and elongate; basal joint stout, slightly arched; 2nd longer than broad, about half as long as the basal one; 3rd rather longer than the contiguous ones; joints 5–8 elongate, the last, however, distinctly shorter and stouter than the 5th; terminal three a little expanded, 10th slightly broader than 9th. *Legs* simple, unarmed; the anterior tibiæ on the inside, below the middle, with a wide excision. *Tarsi* stout, each of the basal four joints transverse, the first largest, the fifth about half the length of the others conjointly; claws small and slender.

Head subquadrate, moderately rounded and narrowed in front. *Clypeus* prolonged anteriorly. *Eyes* coarsely facetted, subrotundate, only slightly convex. *Thorax* notched laterally. *Elytra* subquadrate, costate. *Hind body* gradually attenuated, not longer than the elytra, the basal three segments strongly marginated.

The characters given above show that this genus cannot be associated with *Omalium*, in which the terminal joint of the tarsi equals the basal four taken together, and the clypeus is not produced so as to cover the mandibles. In *Micropeplus* the body is similarly costate, but the tarsi are only tri-articulate, and the antennæ are nine-jointed and abruply clavate. It may be located between these two genera, but, even there, on account of the notch along the inner face of the front tibiæ similar to that seen in the Carabidæ, it will occupy an isolated position.

Eupsorus costatus, sp. n.

Body slightly nitid, almost uniformly pale brown, sparingly clothed with decumbent pallid setæ.

Head smaller than thorax, with two deep longitudinal cavities, the margins and central portion asperate. *Thorax* about as long as it is broad, its sides explanate and of somewhat rounded outline, interrupted, however, by three or four unequal indentations, so that the basal portion appears as if abruptly constricted; there are two strong, but not quite straight, discoidal costæ, which seem rough, but the dilated sides are nearly smooth and shining and very sparsely setose. *Elytra* just as broad as they are long, almost parallel-sided, shoulders rounded; apices bisinuate, so that the true basal segment of the abdomen may be detected from above; they bear three costæ, the suture forming the central one, and there is a curvate humeral elevation on each; their whole surface is coarsely punctured. *Hind body* transversely convex; the four fully-exposed segments

have rather more conspicuous setæ than the elytra, they are, however, rather short and depressed, and the punctuation seems less coarse; the third segment is rather larger than either of the basal two, the apical is narrow and conical. *Legs* and tarsi finely setose, the two hind pairs of tibiæ straight.

Length $1\frac{1}{2}$, breadth $\frac{5}{8}$ line.

Ida Valley.

A single mounted individual of this remarkable little insect was kindly sent to me by Mr. J. H. Lewis.

Group **Pselaphidæ.**

Patreus, gen. nov.

Body elongate. *Antennal tubercles* small. *Hind body* elongate, basal three segments large, nearly equal, with deep sutures. *Metasternum* elongate. *Prosternum* without visible carina. Intermediate *tibiæ* remarkably short, curvate; basal joints of intermediate *tarsi* enormously developed, second smaller than first, the third elongate and slender; with one claw.

This genus should be placed near *Exeirarthra*, the antennæ, however, instead of being like those of *Sagola*, more nearly resemble those of *Zelandius*. From the latter it is distinguished by the more slender form, impunctate surface, much smaller and more anteriorly narrowed head, oviform thorax, shorter antennæ, and slender legs. From all the other *Euplectini* known to me it may be easily recognized by the strongly developed basal joints of the middle tarsi, which indeed somewhat resemble the male feet of an *Aphilon*, one of the Phytophaga, but with the basal joints homogeneous in place of being distinctly separated. The tarsal structure of *Exeirarthra*, another curious form of this group, is materially different, the penultimate joint of the anterior tarsi being distinctly lobate, whilst the terminal is provided with two claws.

Patreus Lewisi, sp. n.

Elongate, nitid, castaneo-rufous; legs, antennæ, and palpi yellow; sparingly clothed with long, slender, greyish pubescence.

Head small, the vertex deeply and unevenly excavate. *Antennæ* pubescent, basal joint large, 2nd shorter and not quite as stout, joints 3–8 small and bead-like, 9th larger than the preceding one, but not so broad as the 10th, 11th

very large. *Eyes* prominent. *Thorax* oviform, rather longer than broad; there is a distinct ante-basal linear impression, a fovea at each side, and a smaller median fovea, but there is no well-developed discoidal groove, the surface is smooth. *Elytra* rather longer than broad, moderately rounded laterally; on each there is a fine sutural stria and short intra-humeral impression, the shoulders appear as if longitudinally elevated. *Legs* moderately long, the front and hind tibiæ straight, their tarsi elongate. *Hind body* with four exposed segments, the basal three strongly margined and of nearly equal length, the first slightly flattened medially.

♂. Length $\frac{5}{8}$, breadth $\frac{1}{8}$ line.

Ida Valley.

I have much pleasure in naming this inconspicuous but interesting little beetle in honour of Mr. J. H. Lewis, who sent me a mounted specimen which he found in an ant's nest. The female apparently has not been seen.

Euplectus caviceps, sp. n.

Elongate, shining, fulvescent, impunctate, clothed with decumbent greyish pubescence; antennæ, palpi, and legs yellow.

Head nearly as broad as the thorax, narrowed anteriorly, its whole central portion deeply hollowed, and with a fine dark longitudinal stria within the cavity, the frontal margin is on nearly the same plane as the flattened tubercles. *Eyes* quite lateral, rather small, convex, coarsely facetted. *Antennæ* moderately short and stout, basal joint stout, 2nd oviform, nearly as large as the 1st, joints 3–6 small and moniliform, 6th slightly smaller than 5th, 7th and 8th transverse and distinctly broader than the preceding one, 9th and 10th transverse, about twice the size of the 8th, 11th large, conical, acuminate, and pubescent. *Thorax* quite oviform, with a transverse impression near the base, terminating in a fovea at each side; between the former and the basal margin there is a small median fovea, and there is also an elongate discoidal impression. *Elytra* subquadrate, their sides moderately rounded, shoulders narrowed; the sutural striæ are well marked, and there is an elongate intra-humeral impression on each. *Hind body* oblong, basal three segments strongly margined and about equal, fourth nearly as long as third, the terminal depressed. *Legs* elongate and slender. *Tarsi* slender, apparently with one claw only.

♂. Length $\frac{5}{8}$, breadth nearly $\frac{1}{4}$ line.

Thompson's Gorge.

Described from one mounted male, which was found under a stone by Mr. J. H. Lewis and forwarded as No. 5877.

Euplectus sulciceps, sp. n.

Elongate, shining, pale castaneo-rufous, sparingly clothed with slender depressed grey hairs; legs and antennæ fulvescent.

Head nearly as broad as the thorax, subtrigonal; at each side, behind the eye, there is a fovea which is prolonged forwards as a broad groove. *Antennæ* short and stout, 2nd joint nearly as large as the exposed portion of the 1st, joints 3–7 small and differing but little from one another, 7th and 8th transverse, 9th evidently larger than the 7th, 10th twice the size of the 7th and distinctly broader than the 8th, 11th large, conical, and acuminate. *Thorax* oviform, with a fovea at each side united to its fellow by a transverse linear impression near the base, close to which there is a smaller central fovea; there is also a slight longitudinal impression on the disk. *Elytra* subquadrate, shoulders narrowed, with a distinct sutural stria and humeral impression, which is sometimes divided, on each. *Hind body* longer than the elytra, its first exposed segment covered with exceedingly minute scales, the following three larger, nearly equal and margined, 4th and 5th deflexed. *Legs* simple.

Congeneric with the preceding species, but differing therefrom in the form of the head and other details.

Length $\frac{5}{8}$, breadth nearly $\frac{1}{4}$ line.

Thompson's Gorge, Otago.

A single specimen, No. 5910, mounted on cardboard. Also found by Mr. Lewis.

Group **Byrrhidæ**.

Curimus vestitus, sp. n.

Convex, oviform, slightly nitid, fusco-piceous, legs reddish, antennæ and palpi piceous; densely covered with flat, small, yellowish-grey and white scales; these last predominate near the hind angles of the thorax, and form irregular spots near the sides of the elytra behind the middle; there are also many erect grey setæ on the sides of the body, on the legs, and on the forehead.

Head suboblong, rather flat, not squamose in front, obtusely rounded there. *Labrum* prominent. *Eyes* quite lateral and longitudinal, not at all conspicuous, much

narrowed backwards. *Mandibles* bifid at extremity. *Thorax* strongly transverse, gradually narrowed towards the acute anterior angles, with a sinuation near each eye, so that the middle of the apex seems rounded, the punctuation concealed and shallow. *Scutellum* triangular. *Elytra* as wide as thorax at the base, their sides nearly parallel, but much curvedly narrowed posteriorly; their striæ are sharply impressed and impunctate, the interstices are plane and finely coriaceous.

Femora grooved underneath; *tibiæ* straight inwardly, rather slender towards the knees, with about six setigerous denticles along the outside, the anterior with a broad shallow impression along the front for the accommodation of the tarsi, the other pairs deeply grooved along the posterior face so that the tarsi, in repose, are almost hidden. *Tarsi* stout and nearly nude, the terminal joint nearly as long as the preceding four taken together.

Antennæ sparingly hispid, 2nd joint nearly as long and stout as the exposed part of the 1st; 3rd and 4th equal, about twice as long as broad; 5th and 6th longer than broad, but shorter than the preceding; 7th short, 8th and 9th transverse, 10th distinctly broader than 9th; 11th large, oblong, closely adapted to the 10th, so these two apparently form the oblong club.

Underside opaque, sparsely studded with suberect, short, coarse grey setæ. Abdomen, like the breast, with coarse shallow punctures; the three intermediate segments short, with strongly curved sutures; the terminal moderately long and narrow, the visible central portion of the basal one large and subtriangular.

Rather smaller and more convex than Nos. 432 and 2512, and recognizable by the dense squamosity. The last species (2512) may be separated at once by the quite acuminate terminal joints of the maxillary palpi.

Length $1\frac{3}{4}$, breadth 1 line.

Ophir, Otago. Two specimens found by Mr. Lewis. The measurements are from a "set out" example, the other retracted one is smaller.

Group Lucanidæ.

Mitophyllus curvidens, sp. n.

Oblong, moderately convex, slightly nitid, variegate, mostly nigrescent, occasionally tinged with violaceous, the sides of thorax and an elongate space on the elytra ferruginous; irregularly clothed with elongate, depressed, pallid

scales; on the elytra more erect, coarser, whitish ones form irregular spots; legs and antennæ pitchy red.

Head, exclusive of mandibles, quite transverse, the middle curvedly depressed in front, distinctly punctate, nearly nude behind. *Thorax* transversely quadrate, bisinuate at base and in front, its sides somewhat explanate, particularly near the front, only slightly rounded; its sculpture is like that of the head, but not so close on the disk, where, in some lights, bluish spots may be seen. *Elytra* parallel-sided, obtusely rounded posteriorly, slightly wider than thorax at base; there are no obvious elevations; their punctuation resembles that of the thorax. Anterior *tibiæ* slightly curved, finely and closely denticulate or serrate externally; the outer extremity is somewhat produced, and there is a dentiform projection before the middle.

Underside shining, punctate, variegated castaneous, sparingly clothed with pale decumbent elongate squamæ or setæ. Prosternum obtusely angulated medially in front. Metasternum large, grooved along the middle. Ventral segments 2–4 decrease a little in length.

Male.—In a specimen of *M. irroratus* (No. 415), which Dr. Sharp kindly identified for me in London over thirty years ago, I find that the mandibles, in repose, form a circle leaving a central gap large enough to admit a pin's head; their apices are tridentate, and the uppermost tooth is somewhat prominent.

In *M. curvidens* the mandibles are shorter, their apices are simple and pointed, the central gap is just large enough to allow the point of a pin to penetrate; on the outside of each, near the middle, there is an acute horizontal protuberance, and, near the extremity, a pair of comparatively large lobes arise; these are directed slightly backwards and outwards; underneath they are broad and plane. The mandibles, in fact, somewhat resemble in miniature those of the grand African dung-beetle, *Heliocopris isidis*.

Female.—The mandibles are rather longer and much further apart than in the same sex of *M. irroratus*; they bear no distinct tooth above, but appear as if cut halfway down near the extremity, so that the apices seem slender and simple; the acute horizontal angulation near the base is well developed. The thorax of *M. irroratus* is much narrowed towards the front, so that the middle is distinctly wider; in *M. curvidens* this is not the case.

The antennæ, in this sex, are similar, the basal joint being smooth, curvate, and about as long as the following six conjointly; the 2nd is transverse, the 3rd and 4th are

longer than broad, the 5th and 6th subquadrate; the 7th is rather larger than the preceding one, and acutely produced in front; the three leaflets of the club are of nearly equal length, but they are barely half as long as those of the male. The eyes are large and prominent.

♂. Length 5, breadth $1\frac{3}{4}$ lines.

♀. Length $4\frac{1}{4}$, breadth $1\frac{3}{4}$ lines.

Karori, Wellington.

Two mounted males and one female, marked No. 68, were forwarded to me for examination by Mr. G. V. Hudson.

Group **Melolonthidæ**.

Mycernus, gen. nov.

Body ovate-oblong, slightly convex, not pubescent. *Clypeus* deeply emarginate medially. *Palpi* short; terminal joint of the maxillary truncate at apex, subsecuriform; the labial very short. *Antennæ* 8-articulate, rather short; the club composed of three leaflets, which are not longer than the preceding five joints combined. Anterior *tibiæ* tridentate externally in both sexes, the upper tooth, in the male, sometimes small. Posterior *coxæ* with stout short prolongations, these only moderately curved. *Sternal process* slender and very narrow, horizontal, its front edge vertical and hardly extending forwards beyond the intermediate coxæ. *Pygidium* exposed, broad, widely rounded.

The type bears a remarkable superficial resemblance to *Pyronota festiva*, which, however, is well differentiated by its large, conspicuous, intercoxal process.

Psilodontia is, undoubtedly, the most nearly related genus, but its intercoxal lamina is curved forwards and downwards to the breast. Its antennæ are dissimilar, and their club consists of more elongate and somewhat curvate leaflets. The clypeus is truncate or slightly rounded apically. The eyes are smaller and less convex. All the palpi are longer. Tarsi longer, their 3rd and 4th joints slender at base, whereas in *Mycernus* the corresponding joints of the anterior are oblong. The appendages of the hind coxæ are slender, much curvate, and acute at the extremity, quite hook-like in fact. The pygidium is only half as broad and almost quite truncate behind.

Mycernus elegans, sp. n.

Glossy, brilliant green; a longitudinal discoidal stripe and an irregular space near each side of the thorax; the

suture and a lateral streak on each elytron, and the scutellum, are rufous; legs and antennæ testaceous.

Head convex between the eyes, nearly smooth there; clypeus with raised margins, its sculpture rugose-punctate, but rather shallow. *Thorax* transverse, widely emarginate at apex; base bisinuate, with rectangular angles; anterior angles subacute; the sides are indistinctly angulate before the middle, gradually narrowed anteriorly, nearly straight behind; the base, therefore, is rather wider than the front; the surface is almost smooth and polished; the sides bear a few grey setæ similar to those on the legs. *Elytra* oblong, apices rounded, their sides gently curved, shoulders obtuse; they are punctate-striate, the outer striæ, however, are shallow or obsolete; interstices nearly plane, with a few minute distant punctures. *Underside* infuscate, rather sparingly clothed with white setæ.

Legs elongate, the hinder pairs of tibiæ bicalcarate at apex. *Antennæ* sparsely hispid: basal joint clavate at extremity; 2nd also stout, subglobular, 3rd slightly longer than 4th, each of these nearly twice as long as broad; 5th broad but very short, thicker at one part than the other; club feebly pubescent.

♂. Length 3, breadth 1¼ lines.

Ophir. Amongst the sands of the Manuherikia River.

Six specimens, both sexes, discovered recently by Mr. J. H. Lewis.

Prodontria, gen. nov.

Body convex, subovate, nearly nude. *Clypeus* with reflexed margins, obtusely rounded, its basal suture nearly straight, the front face perpendicular. *Labrum* horizontal, deeply notched, so that the outer lobes appear prominent. *Palpi* rather short, their terminal joints elongate; the labial apparently invisible. *Antennæ* inserted just below and in front of the eyes, 8-articulate; basal joint clavate, as long as the following three conjointly, these three hardly twice as long as broad; the four terminal leaflets are elongate and minutely pubescent. *Thorax* strongly transverse, deeply incurved in front, bisinuate at base, distinctly marginated. *Scutellum* large, rounded. *Elytra* convex, broadly oval, marginated, truncate at extremity. *Pygidium* exposed, vertical, rounded. *Tibiæ* nude, the anterior tridentate externally; the other pairs with spiniform setæ, the apical rims semicircular, truncate and subserrate, and with short coarse ciliæ. *Tarsi* elongate, 5-jointed, claws simple.

Abdomen with five segments, the basal four nearly equal, fifth very short, scarcely visible towards the sides.

This genus is closely allied to *Odontria*, and should precede it in the New Zealand list. The typical species of both genera, however, differ in shape and general appearance, and may be distinguished almost at a glance. In *Odontria* the metasternum is moderately elongate, and the middle femora are, in repose, received in a broad groove or impression, which is limited by fine frontal and posterior margins. In *Prodontria* the metasternum is more reduced, so that the space between the middle and hind pairs of legs is less than that between the front and intermediate ones, just the reverse of what obtains in the older genus, and, moreover, the middle thighs have no depressions for their accommodation, there being a fine elevated carina on that part of the sternum, and behind it the face seems nearly vertical.

Prodontria Lewisii, sp. n.

Robust, subovate, a little nitid, almost nude above, there being only a grey fringe under the base of thorax and a few erect scattered setæ on the clypeus that can be easily seen; colour fusco-testaceous, the legs and antennæ testaceous.

Head quite half the width of thorax, its central portion distinctly and irregularly punctured, the clypeus coarsely and rugosely punctured, the intervals minutely. *Thorax* twice as broad as it is long, deeply and widely incurved in front, anterior angles acute and attaining the middle of the eyes; its sides strongly and irregularly rounded, but in one specimen there is an obsolete angulation at each side, and in it the sides appear to be gradually narrowed towards the base and apex; base strongly bisinuate, its angles distinct but not at all projecting; the surface with distinct but finer punctures than the head. *Scutellum* punctate. *Elytra* rounded laterally, not wider than thorax at the base, apices truncate; each elytron has eight more or less evident striæ, these are moderately finely and regularly punctured, but the apical sculpture becomes confused and punctiform, and the outer striæ are somewhat abbreviated; interstices finely and irregularly punctured, in some of these punctures minute setæ may be detected.

Underside testaceous, more or less finely punctured, sparingly and finely pubescent, but bearing elongate silky greyish hairs on the prosternum. *Club* of antennæ composed of four

leaflets in both sexes, and about as long as the preceding four joints combined.

Length $7\frac{1}{2}$, breadth 4–$4\frac{1}{2}$ lines.

Cromwell.

Described from three mutilated individuals found by Mr. J. H. Lewis on the sand-hills of Molyneux River.

Group **Dynastidæ**.

Pericoptus frontalis, sp. n.

Fusco-piceous, a little shining; legs and antennæ ferruginous.

Thorax strongly transverse, anterior angles oblique and very obtusely rounded for quite a third of the entire length, its sides nearly straight behind, base bisinuate; the frontal protuberance is very small or obsolete, and the impression just behind it is shallow; the fovea-like depression near each side is more distinct. *Elytra* oblong, apices subtruncate; each bears a sutural stria, the punctuation is distinct but irregular.

Underside rather closely and finely sculptured, the punctures on the abdomen are most distinct. Pygidium closely and finely punctured. Sternal villosity very slender and elongate, testaceous.

Head with rather shallow scanty punctuation behind; the anterior margin of this part is rather abruptly deflexed, but not at all ridged, and forms a sort of step to the lower plane of the frontal portion; this latter anterior part is somewhat horizontal and has a transverse depression at its base, its sides are nearly straight for half its length, but are then obliquely narrowed, the reflexed and truncate apical margin, however, occupies about one-half of the whole width; the frontal sculpture consists of moderate longitudinal rugæ near the sides, but the middle is nearly smooth; there are no distinct punctures there.

The head is, I think, sufficiently differentiated from that of the other species to render its recognition easy when carefully compared with typical specimens, but as many other students may not possess these types, I now add brief notes for reference.

P. truncatus.—Head short, its frontal portion flattened, but forming a rather abrupt declivity; in shape it is, roughly, transversely oval.

P. punctatus.—Head, in front, on nearly the same plane as in *P. truncatus*, but, instead of being transversely oviform,

it is greatly narrowed anteriorly, so as to be of somewhat triangular outline.

P. stupidus.—Head indefinitely transversely elevated on the middle, the clypeus much narrowed to the front, and the front edge in the middle a little reflexed and obscurely emarginate. Head rough all over the upper surface.

P. nitidulus.—Head, in front, short, deflexed, narrowed anteriorly, but quite truncate at the middle of the apex; there is no obvious transverse elevation limiting this clypeal portion from the vertex. Head almost smooth above, the frontal and lateral punctuation less coarse than is usually seen.

Length 9, breadth 5 lines.

Cromwell sand-hills, Molyneux River.

Described from a mutilated individual forwarded by Mr. J. H. Lewis.

Group Opatridæ.

Syrphetodes nodosalis, sp. n.

Opaque, fuscous, speckled with ochraceous and pale ferruginous squamæ; antennæ, palpi, and tarsi ferruginous.

Thorax 2 lines broad by $1\frac{1}{4}$ long, exclusive of the anterior angles, which project as far as the front of the eyes; it is widest behind the middle; the sides are gradually widened anteriorly, sometimes there is a slight sinuosity there, towards the base they are distinctly sinuate; the posterior angles are acute; there is an obtuse elevation behind the middle; the front is emarginate and slightly raised, but the discoidal sculpture is quite hidden by the decumbent, variegate, setiform squamæ. *Scutellum* strongly transverse, dark fuscous. *Elytra* oblong, gradually narrowed and rounded posteriorly; at the base they are evidently wider than the thorax; at each shoulder, but not forming a lateral projection, there is an obtuse nodiform elevation; there is another at each side of the scutellum, two before the middle, and two more in line with these but placed further back; an elongate elevation near the suture, on top of the hind slope, usually consists of two contiguous nodosities; there are also some smaller inequalities; their sides are somewhat explanate, and are marked with large foveæ; the apex is triangularly excised; the discoidal punctures are very irregular, but there is a distinct sutural series on the posterior declivity.

Antennæ stout, setose, reaching backwards to the shoulders;

3rd joint twice the length of the 2nd; 4–8 of nearly equal length, but becoming more slender, terminal three joints minutely pubescent.

Legs elongate and maculate.

Underside nigro-fuscous, with depressed ochry setæ. Epipleuræ broad and plane.

Undoubtedly nearly allied to *S. simplex*, but differing therefrom in its broader thorax, which, moreover, is quite distinctly nodose above; the humeral angles are wider and less rounded, and the elytral nodosities are more numerous, though very much smaller than those seen on *S. crenatus*, *S. dorsalis*, and *S. bullatus*.

Length $4\frac{1}{2}$–$5\frac{1}{4}$, breadth $1\frac{7}{8}$–2 lines.

Pelorus Sound. Found by Mr. J. J. Walker.

Var.—Joints 4 and 5 of the antennæ slightly longer, more slender, and less setose. Thorax narrower, $1\frac{5}{8}$ line. The antemedian elytral nodosities obsolete. This probably is a sexual variety.

Paraphylax sternalis, sp. n.

Subquadrate, covered with a hard coating of fuscous sappy matter, through this some dark setæ protrude; when denuded the surface is found to be slightly shining infuscate red.

Head smooth, much wider in line with the eyes than it is elsewhere, so that these organs appear very prominent; the clypeus is a little longer and narrower than is the case in *P. binodosus*, and there is a fine central longitudinal groove between the eyes which is lacking in that species. *Antennæ* with the basal joint transversely quadrate and having a very slender basal attachment; 2nd hardly longer than 1st; 3rd stout, oviform, about twice the length of the preceding one; joints 4–8 oviform, each becoming slightly shorter and narrower, all these more or less dark and somewhat scabrous; 9th triangular, longer than broad, slender at base, distinctly longer than 8th, 10th of similar form, but rather shorter and broader, 11th rotundate—these last three red, with less and finer pubescence, their outstanding setæ also are much finer. *Thoraæ* cordiform, transverse; the sides, when cleaned, appear flat, with an obtuse lateral lobe partially covering the front thigh; behind this they are curvedly narrowed, so that there is no trace of posterior angles; the disk is abruptly elevated, and bears two conspicuous nodosities in front, which are separated by a deep channel. *Scutellum* obsolete. *Elytra* quadrate, abruptly deflexed and contracted apically, their basal portion depressed and deeply incurved;

near the suture, on each, there is one regular series of distinct and moderately close punctures extending from base to apex; the second series reaches from the apex to beyond the middle, but between it and the shoulder there are some irregular, oblique, and more distant rows; the series near the side are irregular and almost curvate; the surface is uneven, but there are no well-defined nodosities. *Legs* variegated with brown, testaceous, or red, yet seldom constant, the setæ similarly mottled.

Underside covered with infuscate matter and numerous flavescent setæ. When carefully scraped the prosternum appears truncate instead of being somewhat emarginate; interposed between the front edge and the coxæ there is a transverse groove, and behind this a distinct ridge; the coxæ are rather further apart than in *P. binodosus*, and the intervening space is plane instead of being concave, as it is in that species.

Length $2\frac{1}{2}$–3; breadth $1\frac{1}{2}$–$1\frac{5}{8}$ lines.

Wellington.

Mr. G. V. Hudson kindly sent me some specimens of this interesting species.

Group **Rhipiphoridæ.**

Rhypistena cryptarthra.

Narrow, elongate, dull black, clothed with short decumbent cinereous pubescence; antennæ and tarsi fuscous, palpi paler.

Head densely and minutely punctate. *Thorax* very much, yet gradually, narrowed anteriorly, so that there it is not half the width of the head; its base is deeply bisinuate, and the posterior angles clasp the shoulders; it is very obtusely elevated along the middle, and its sculpture is like that of the head. *Scutellum* large, triangular. *Elytra* elongate, scarcely any wider than the thorax at the base; apices acutely rounded; they are closely and minutely sculptured, and have, on each, two or three indistinct costæ. *Tarsi* long and slender.

Antennæ elongate, basal joint stout and evidently longer than third, second rather longer than broad, third hardly any longer than it is broad and slender at the base, fourth excessively short and almost indistinguishable; joints 5–10 very short, each with a long slender lobe equalling the four basal joints taken together; eleventh equally elongate; these seven lobes, in repose, are closely adapted to one another.

The anterior *tibiæ* are unarmed, the others are provided with small spurs; the hind *claws* are finely appendiculate, so that the extremity appears very slender.

The great length of the lobes and the abbreviation, or concealment, of the fourth joint of the antennæ differentiate this species.

Length $3\frac{1}{2}$, breadth $\frac{5}{8}$ line.

Tarukenga. Two males taken off shrubs in the bush adjoining the Rotorua Railway.

Rhypistena sulciceps.

Opaque, black, clothed with depressed ash-coloured pubescence; the hairs on the head are, however, more distinct and almost quite grey; legs fuscous, the front tibiæ and the two anterior pairs of tarsi are of a pale chestnut colour.

Similar to *R. lugubris*, but differing therefrom in being more distinctly, yet finely, and more densely punctured, in having a well-marked furrow on the back of the head, and in the antennal structure. The basal joint of the antennæ is almost as long as the following two conjointly, the third is not twice the length of the second, the fourth is very short, and the lobes of the others are stouter than those of that insect. The tibiæ, excepting the front pair, have short slender spurs.

Length $3\frac{3}{4}$, breadth $\frac{3}{4}$ line.

Mount Arthur. One example found by Messrs. Cheeseman and Adams many years ago.

[To be continued.]

IX.—*Description of a new Species of the Neuropterous Family* Nemopteridæ. By W. F. Kirby, F.L.S., F.E.S.

Since the publication of my notes on this family in the 'Annals' for 1900, the most important addition to it received in the Natural History Museum has been a long series of a new and rather variable species from Asia Minor, which I describe below. I was at first inclined to think that more than one species might be represented among these specimens, but cannot find any tangible characters to subdivide them. The insects of this family, though of considerable size and probably gregarious in their habits, are very frail, and are rarely received in any number or in good condition.

The present insect is most nearly allied to my genus *Chasmatoptera*, the type of which is an Australian insect; but it is not unlikely that it may ultimately be referred to a new

genus, when the already described but imperfectly known allied forms, and others which no doubt remain to be discovered, can be fully studied.

Genus Chasmatoptera.

Chasmatoptera, Kirb. Ann. & Mag. Nat. Hist. (7) vi. p. 462 (1900).

The rather short, stout, and strongly pubescent antennæ are quite sufficient to separate the type of this genus (*Nemoptera Huttii*, Westw., from Australia) and the new species described below from *Halter*, Ramb., in the typical species of which the antennæ are slender, naked, and longer than the body.

Chasmatoptera Sheppardi, sp. n.

Dimensions.

	♂. mm.	♀. mm.
Long. corp.	12–14	13–14
Exp. al. ant.	36–40	38–46
Long. al. post.	28–33	30–34

Antennæ entirely black; head black above, often marked with yellow behind; face yellow, with a broad black median stripe extending to the end of the rostrum. Thorax black above, often spotted with yellow, especially in the male; abdomen black above, with yellow incisions, and in the male with yellow dots between. Under surface of the body mostly yellow, of abdomen often reddish. Wings clear hyaline, with brown nervures; costal nervure slenderly blackish; subcostal nervures and sometimes intermedian space yellowish. Hind wings with the shaft yellow, with two black dots on the outer side and one on the inner; at the extreme base short transverse lateral lines are sometimes visible. Beyond the middle the wing expands into a very broad spatulate lobe, with reticulated neuration, followed by a smaller and narrower one, and then by a short terminal lobe, rounded at the end. The lobes are purplish brown, and in the male are preceded by a white space; and the contracted part of the wing between the lobes is white on each side, the shaft always remaining dark; in the female both lobes are often entirely dark, but the terminal lobe is always white.

Hab. Amanus Mountains, Asia Minor (*Dr. Sheppard*).

Much resembles the South African *Nemoptera dilatata*, Klug, which is probably congeneric if the antennæ are pubescent, which the figure and description do not show. In that species, however, the head is yellow above.

X.—*Rhynchotal Notes.*—XXIV. By W. L. Distant.

These notes and descriptions refer to species which are all contained or represented in the British Museum.

Heteroptera.

Fam. Coreidæ.

Mictis loricata, sp. n.

Above metallic green; antennæ, membrane, two large oblong discal spots to pronotum, and the corium (excluding lateral margins) dull black; head above, body beneath, and legs ochraceous; uppersides of femora and tibiæ (the last excluding apical thirds) castaneous; odoriferous apertures, three spots on second, third, fourth, and fifth, and a curved fascia on sixth abdominal segments black; first and fourth joints of antennæ longest and subequal in length, second longer than third; pronotum rugulose and coarsely punctate, its lateral margins coarsely serrate; scutellum transversely rugulose; corium sparingly deeply punctate; a short obtuse tubercle on each side of second and third abdominal segments.

♂. Posterior femora incrassate, curved, with a series of short tubercles on apical third of under surface; posterior tibiæ slender, inwardly dilated into an acute spine beyond middle.

Long., ♂ ♀, 26–28 mm.

Hab. Congo Region: Angola (Brit. Mus.).

This appears to be the species figured in Thomson's Archiv. Entomol. as *M. metallicus*, Sign., to which the species is allied, but may always (apart from structural characters) be differentiated by the two large discal spots, sometimes fused, to the pronotum, and by the three spots to the second, third, fourth, and fifth abdominal segments. The type of Signoret's species being in the Vienna Museum, I wrote to Dr. Handlirsch on the subject, who kindly examined the *M. metallicus*, and wrote me as follows:—"There are two type specimens in our museum, in both of which the pronotum is unicolorous, and there are two rows of black spots on segments 2–5." I have seen a very long series of both species.

Fam. Pyrrhocoridæ.

Physopelta melanoptera, sp. n.

Black; lateral and posterior margins of pronotum, corium,

and connexivum sanguineous; clavus, a very large medial spot, and apical angle to corium black; antennæ pilose, basal half of fourth joint stramineous, first joint slightly shorter than second, longer than third; pronotum with the posterior area coarsely punctate, lateral margins somewhat strongly reflexed; clavus coarsely and somewhat thickly punctate; rostrum passing the posterior coxæ and about reaching centre of second abdominal segment.

Long. $10\frac{1}{2}$–$12\frac{1}{2}$ mm.

Hab. West Africa: Cameroons (Brit. Mus.).

Allied to *P. analis*, Sign., but differing by the longer rostrum, different colour, &c.

Fam. Capsidæ.

Pœciloscytus cuneatus.

Lygus cuneatus, Dist. Biol. Centr.-Am., Rhynch. i. p. 435, t. xxxvii. fig. 24 (April 1893).
Pœciloscytus (*Lygus*) *cuneatus*, Uhler, Proc. Zool. Soc. 1894, p. 192.
Pœciloscytus obscurus, Uhler, Proc. Zool. Soc. 1893 (November), p. 715.

Paracarnus grenadensis, sp. n.

Paracarnus mexicanus, Uhler (nec Dist.), Proc. Zool. Soc. 1894, p. 194.

Pronotum more elongate than in *P. mexicanus*, basal margin of scutellum concolorous, not fuscous; spots at apex of clavus and narrow transverse fascia at apex of corium bright sanguineous, not fuscous; body narrower and more elongate.

Long. 3 mm.

Hab. Island of Grenada: Balthazar (*H. Smith*, Brit. Mus.).

Annona Smithi, sp. n.

Annona labeculata, Uhler (nec Dist.), Proc. Zool. Soc. 1894, p. 194.

A much narrower species than *A. labeculata*; pronotum (with the exception of the anterior collar) shining black, not ochraceous; basal half of clavus not castaneous, but its inner margins fuscous; corium with a subapical transverse fuscous fascia not reaching lateral margins.

Long. $2\frac{1}{2}$ mm.

Hab. Island of Grenada: near Balthazar (*H. Smith*, Brit. Mus.).

Annona antilleana, sp. n.

Mala decoloris, Uhler, Proc. Zool. Soc. 1893, p. 705.

Head, anterior frontal collar, and scutellum pale shining stramineous, glabrous; pronotum (excluding anterior collar

and lateral and posterior margins) ochraceously punctate; clavus ochraceous; corium and membrane pale hyaline; antennæ dark ochraceous; apices of second and third joints fuscous; eyes fuscous; body beneath and legs stramineous; lateral margins of head beneath and sternum ochraceous.

Long. 3 mm.

Hab. Island of St. Vincent (*H. Smith*, Brit. Mus.).

This species has little in common with *Annona decoloris*, Dist.

Fam. **Gelastocoridæ.**

Subfam. *Mononychinæ.*

Mononyx luteovarius, sp. n.

Fuscous; lateral margins of head and pronotum, clavus, basal lateral margins of corium and connexivum pale luteous, spotted with fuscous; body beneath black; head beneath pale luteous with corresponding marginal markings to those above; femora dark brownish castaneous; apices of femora and the tibiæ and tarsi ochraceous; anterior tarsi and bases and apices of intermediate and posterior tarsi piceous. Head with two prominent tubercles between eyes, apex concavely sinuate, with two obtuse spines and another similar spine on each side nearer eyes; pronotum with the disk profoundly excavated, a transverse impression a little behind anterior margin and another beyond middle, the last crossed by three prominent striæ, lateral margins ampliately rotundately produced; head, pronotum, and scutellum thickly punctate; apex of scutellum, mottlings to corium, and apical margin to membrane pale luteous.

Long. 8½; exp. pronot. angl. 6½ millim.

Hab. Queensland: Townsville (*F. P. Dodd*, Brit. Mus.).

Fam. **Nepidæ.**

Genus Laccotrephes.

Laccotrephes flavovenosa.

Nepa flavo-venosa, Dohrn, Stett. ent. Zeit. xvi. p. 409 (1860).
Laccotrephes japonensis, Scott, Ann. & Mag. Nat. Hist. (4) xiv. p. 450 (1874).

The British Museum contains specimens from India, Ceylon, Siam, Formosa, China, and Japan, including Scott's type.

Laccotrephes calcar, sp. n.

Fuscous brown; abdomen above purplish brown, the apical segment brownish ochraceous; wings pale lacteous hyaline, the veins ochraceous; anterior femora with a long curved subbasal spine on their under surface, its apex ochraceous; pronotum long, about as long as the intermediate femora, its surface finely granulate or tuberculate, its central carinæ prominent, its basal margin strongly concavely sinuate before scutellum, which is about as long as pronotum from before the basal transverse constriction; abdominal appendages more or less mutilated.

Long. body, excl. append., 49 mm.

Hab. Nigeria: Abutshi River (Brit. Mus.).

A species peculiar by the long (3 mm.) curved basal spine to the anterior femora.

Laccotrephes nyasæ, sp. n.

Very dark fuscous or piceous; abdomen above black, with a large pale ochraceous space occupying about half the area of the second segment, nearly the whole of the third and fourth segments, and the central area of the fifth segment; wings pale hyaline, with the veins dark fuscous; femora with a more or less distinct greyish annulation a little beyond middle, and tibiæ similarly marked a little beyond base. Appendages much longer than body, not quite twice the length; pronotum sparingly finely granulate or tuberculate, the central carinæ strongly pronounced, before scutellum strongly concavely excavated; sternum finely granulate or tuberculate.

Long. body, excl. append., 40–42; length append. 68 mm.

Hab. Nyasaland: Nyika Mountains, 6000–7000 feet (*A. Whyte*, Brit. Mus.).

This species may be primarily recognized by the peculiar coloration of the upper surface of the abdomen and by the very long abdominal appendages.

Genus Ranatra.

Ranatra fuscoannulata, sp. n.

Tawny brown; legs ochraceous, intermediate and posterior legs annulated with fuscous; corium with marginal series of linear black spots; abdomen above reddish ochraceous, its apex piceous; metasternum bilobed; apex of membrane not passing the fifth abdominal segment; anterior femora with a

strong spine just beyond middle; intermediate and posterior femora shorter than either the hemelytra or tibiæ; eyes moderately large and prominent; pronotum considerably less than half the length of abdomen; abdominal appendages more or less mutilated.

Long., excl. abdom. append., 35 mm.

Hab. E. Centr. Africa: Ruwenzori (*Scott Elliot*, Brit. Mus.).

Ranatra cinnamomea, sp. n.

Cinnamon-brown; abdomen above dull red, the connexivum ochraceous; anterior margin of head beneath black; pronotum beneath longitudinally fuscous; metasternum ovate, with its lateral margins incised; apex of membrane not reaching the sixth abdominal segment; anterior femora with a strong spine beyond middle; intermediate and posterior femora about as long as the hemelytra and a little shorter than the tibiæ; eyes large and prominent; pronotum about half the length of abdomen; abdominal appendages much longer than the body.

Long., excl. abdom. append., 38–39; length abdom. append. 50 mm.

Hab. S. Africa: Pirie Bush (*A. N. Stenning*); Durban (Brit. Mus.).

Ranatra varicolor, sp. n.

Fuscous brown; head ochraceous; about apical half of pronotum, anterior coxæ, abdomen beneath, intermediate and posterior legs piceous or black; abdomen above dull red, its apex piceous, the connexivum ochraceous; hemelytra more or less mottled with ochraceous; metasternum oblong, centrally depressed; apex of membrane reaching the fifth abdominal segment; anterior femora mutilated; intermediate and posterior femora a little shorter than the hemelytra and also shorter than the tibiæ; eyes large and prominent; pronotum about half the length of abdomen; abdominal appendages much longer than the body.

Long., excl. abdom. append., 44; length abdom. append. 58 mm.

Hab. "South Africa" (Brit. Mus.).

Ranatra natalensis, sp. n.

Allied to *R. varicolor*, but differing by the unicolorous hemelytra, head and legs concolorous; metasternum broadly and prominently centrally sulcate; apex of abdomen brownish

ochraceous, not piceous; membrane reaching the base of the fifth abdominal segment; intermediate and posterior femora longer than the hemelytra, but shorter than the tibiæ; pronotum about half the length of abdomen; abdominal appendages mutilated.

Long., excl. abdom. append., 35 mm.

Hab. Natal: Durban (Brit. Mus.).

Ranatra sordidula.

Ranatra sordidula, Dohrn, Stett. ent. Zeit. xxi. p. 409 (1860).
Ranatra unicolor, Scott, Ann. & Mag. Nat. Hist. (4) xiv. p. 452 (1874).

Synonymic Note.

Philia jactator.

Philia jactator, Stål, Œfv. Vet.-Ak. Förh. 1854, p. 231.
Philia fenestrata, Bredd. Abh. Ges. Halle, xxiv. p. 35 (1901).

Mr. Kirkaldy showed me a cotype of Breddin's species.

XI.—*A new Family of Crustacea Isopoda.*

By George M. Thomson, F.L.S.

[Plate I.]

In the 'Mission de l'Ile Campbell,' published in 1885, the late Dr. Filhol briefly described (p. 492) an Isopod obtained at Stewart Island as *Idotea Stewarti*, and figured it at pl. liii. figs. 8 and 9. The following is a translation of the very brief description:—

"Inner antennæ very short, 4-jointed; terminal joint elongated, slightly enlarged in the middle. Its apex reaches the end of the second joint of the outer antennæ. The latter are 5-jointed; their lower margin is furnished with numerous harsh hairs. The three first pairs of feet increase in size posteriorly; their third, fourth, and fifth joints are furnished with numerous hairs on their lower margins; the claws are long, slender, recurved, and acute. The last segment is elongated and rounded at its apex."

Among some Crustacea received from my friend Dr. Chilton, from Mr. H. Drew of Wanganui, were two dried specimens of this species.

In 1900, during trawling-operations on the east coast of

this island (the south island of New Zealand), two more specimens of this species were taken in about 40 fathoms.

A superficial examination satisfied me that the species was not an *Idotea* at all, while a closer inspection showed that, while belonging to the tribe Valvifera, it did not come under any of the existing families—Idotheidæ, Arcturidæ, or Chætiliidæ—differing from them in the possession of a 3-jointed palp on the mandibles. I have therefore to institute not only a new genus, but a new family. At the suggestion of my friend the Rev. T. R. R. Stebbing I have named it *Hologgnathus* (ὅλος and γνάθος).

Tribe Valvifera.

Family **Hologgnathidæ**.

Resembles Idotheidæ in general appearance, but the mandibles bear a 3-jointed palp.

Genus Hologgnathus, nov.

Body elongated, depressed; coxal plates well defined, except in first segment of mesosome. Cephalon distinctly divided into two parts by a transverse fissure; posterior portion short. Abdomen 5-jointed, four small joints preceding the large terminal one. Eyes distinct, lateral. Superior antennæ 4-jointed; inferior antennæ pediform, flagellum 1-jointed. Mandibles strong, with the cutting-edge produced into an acute lobe, molar tubercle well developed; palp 3-jointed. Maxillæ normal. Maxillipeds with a 5-jointed palp. Legs stout, somewhat uniform in structure; claw strong, hook-like, and unequally bidentate at the apex. Anterior pairs of pleopoda with smooth broad lamellæ; two posterior pairs with setose branches. Uropoda lamellar, valve-like; outer part cut off by a transverse suture and bearing a second setose plate on the inner face. Incubatory pouch normal.

Hologgnathus Stewarti, Filhol. (Pl. I.)

1885. *Idotea Stewarti*, Filhol, Mission de l'Ile Campbell, p. 492, pl. liii. figs. 8 & 9.

The body is elongated, that of the male being 40 mm. long and 11 mm. broad, of nearly even width throughout, convexly rounded above.

The cephalon has the front margin nearly transverse, very slightly hollowed in the middle, and slightly produced at the

infero-anterior angle; from below its front margin on the median line there projects a small process which is separated by a fissure from the acute ridge of the upper lip. On its posterior margin the median line of the cephalon is received into a deep indentation of the first segment of mesosome, and it is distinctly divided into two articulations by a transverse fissure.

The mesosome is nearly two thirds the length of the whole body; the first segment has no separate coxal plate; the plates of the second to the fourth segments are short; on the fifth to the seventh they are well developed and acutely produced backwards.

The first segment of the mesosome is broad and is slightly produced forwards at the sides; on the median line it is hollowed to receive the cephalon, and on its dorsal surface it bears a transverse suture like an imperfect articulation; its posterior margin is nearly transverse. The second, third, and fourth segments are narrow, subequal in width, and transverse; the fifth, sixth, and seventh are slightly broader.

The metasome shows five distinct joints, the first four being very narrow, while the last is produced into a large terminal piece, which is evenly rounded behind.

The eyes are placed obliquely near the antero-lateral margin of the cephalon; they are nearly linear in form and contain several hundred facets.

The inner antennæ are small and have a peduncle of three joints, of which the basal is much the stoutest; the flagellum is 1-jointed and is nearly as long as the peduncle, and is directed upwards.

The outer antennæ are 23 mm. in length and pediform. They are 5-jointed, and bear a short 1-jointed flagellum, which ends in a tuft of hairs.

The mandibles have a strong bidentate cutting-edge, bearing a second much shorter lobe on the inner side; the spine-row is short and carries 5 or 6 short curved spines; the molar tubercle is thick and strong; in front of the palp the basal portion is produced into a rounded tooth.

The palp of the maxillipeds is 5-jointed, the terminal joint being lamellate and rounded at the end.

The legs are strong and are furnished along the lower sides of the merus, ischium, and carpus with thick tufts of hairs. The first three pairs are directed forwards and are thickly fringed on the lower margins of their joints with these harsh hairs; the dactyla are long, slender, and curved, and end in the usual brown spines, which are furnished with a short spine at their base. The fourth pair of legs are quite short,

the last five joints being much contracted and furnished on their inferior outer margins with rows of short pectinate spines. The fifth to seventh pairs are directed backwards and increase in length posteriorly; they have strongly curved dactyla.

The uropoda are large, lamellar, and valve-like, folding over and almost completely covering the abdominal cavity; the posterior third is cut off by a transverse suture, forming a separate plate, which on its inner side bears a smaller fringed plate; these two branches thus complete the valvular flaps.

On opening out the uropods five pairs of pleopoda, each with two well-developed oblong plates all closely folded over one another, are displayed. The plates of the first two pairs are thickly fringed with fine setæ on the margins; those of the last three pairs are simply branchial.

Hab. As already noted, this species has been obtained at Stewart Island (no special locality or depth given), at Timaru in 40 fathoms, and (presumably) at or near Wanganui in the North Island.

EXPLANATION OF PLATE I.

Hologna thus Stewarti, Filhol.

Fig. 1. Animal, dorsal view, nat. size.
Fig. 2. Ditto, lateral view, nat. size.
Fig. 3. Inner antenna.
Fig. 4. Outer antenna.
Fig. 5. Upper lip.
Fig. 6. Lower lip.
Fig. 7. Left mandible.
Fig. 8. Right mandible, from inside.
Fig. 9. Ditto, from outside.
Fig. 10. First maxilla.
Fig. 11. Second maxilla.
Fig. 12. Maxillipeds.
Fig. 13. Uropod.

XII.—*Origin and Fate of the Body-cavities and the Nephridia of the* Actinotrocha. By R. P. Cowles, Ph.D., Adam T. Bruce Fellow in Zoology, Johns Hopkins University, Baltimore, Md.*

Since 1846, when J. Müller discovered *Actinotrocha branchiata*, many investigators have turned their attention to the anatomy and development of *Phoronis*; but it is only within

* From the 'Johns Hopkins University Circular,' April 1904, pp. 28-37.

the last twenty-five years that a more or less careful examination of the internal anatomy of the larvæ and adults of this most interesting animal has been made.

During this time quite a number of papers have been written on the embryology of several species of *Phoronis*, and these are remarkable for the great disagreements concerning certain fundamental facts in the development. However, the conflicting nature of these descriptions, it seems to me, is probably very largely due to specific differences.

The above accounts, together with attempts to trace a relationship between *Phoronis* and the Chordates, or even the Vertebrates, through the *Actinotrocha*, have stimulated investigation, with the result that within the last two years several papers have appeared which practically agree on certain important points of special theoretical interest.

Body-cavities.—Reference to the literature published on the larval body-cavities of the *Actinotrocha* shows that our knowledge is in a very perplexing state. One investigator finds a single body-cavity, others tell us there are two, another describes three body-cavities, and one worker claims that there are five.

Roule is the only investigator who considers the *Actinotrocha* to have but one body-cavity. He denies the presence of any mesenteries in the larva of *Phoronis Sabatieri*, and says that the lining of the body-cavity has its origin from mesenchymatous cells which arise partly from the endoderm and partly from the "bandelettes mesoblastiques" (nephridial pit).

I have been able to examine the *Actinotrochæ* of *P. Sabatieri* through the kindness of M. Marc de Sélys-Longchamps, and have found that there is a mesentery present along the line of the tentacles as in other species, but that it is not very highly developed. With the material at hand I am unable to give any opinion as to the presence of a mesentery anterior to this one.

Caldwell, from a study of the development of *Phoronis Kowalevskii*, finds that the *Actinotrocha* has but two body-cavities, separated from one another by a mesentery which is inserted along the line of the bases of the tentacles. This investigator claims that the mesoderm arises partly from archenteric diverticula bilaterally placed immediately back of the blastopore, partly from the walls of the archenteron posterior to this, and partly from the posterior pits (nephridial pit), which he considers to be of endodermal origin.

Longchamps, who has recently studied the same form, denies that archenteric diverticula exist. He recognizes a

transverse mesentery inserted along the line of the bases of the tentacles, a ventral mesentery in the posterior body-cavity, and an incomplete transverse mesentery separating the hood from the rest of the body. This latter, however, he believes is a secondary structure, and so considers the *Actinotrocha* to have two body-cavities—one in front of the mesentery along the line of the tentacles, and one back of this.

The lining of the former he finds has its origin from mesoderm-cells arising in a diffuse manner from the walls of the archenteron; the lining of the latter, he seems to think, may arise from cells of the nephridial pits.

Menon's paper deals only with the full-grown *Actinotrocha*, and his study leads him to believe that this creature has three body-cavities, separated from one another by two complete transverse mesenteries corresponding to the incomplete mesentery and the mesentery along the line of the tentacles of which Longchamps speaks. He also recognizes the existence of a ventral mesentery and indications of a dorsal mesentery in the posterior body-cavity.

Masterman, from a study of the early stages in the development of *P. Buskii*, considers that five body-cavities are represented in the *Actinotrocha*—one median anterior and two pairs of body-cavities back of this one. According to his account of the anatomy of the *Actinotrocha*, however, there are but three body-cavities, which he calls the preoral, collar-, and trunk-cavities. He describes the same mesenteries that Menon speaks of, and beside these a dorsal mesentery in the collar-cavity.

Ikeda's description of the body-cavities of the Japanese *Actinotrochæ* is of special interest because he is the first to describe a mesodermal sac arising immediately in front of the mesentery along the line of the tentacles. This sac makes its appearance rather late in the life of the larva and, after metamorphosis, gives rise to the lining of the supraseptal cavity of the adult. Ikeda finds the same mesenteries in the *Actinotrocha* that Longchamps does, and also describes the mesentery back of the preoral lobe as incomplete. He has scarcely anything to say concerning the origin of the mesenteries, but he finds that the mesoderm arises, in part at least, from two bilaterally placed archenteric diverticula.

Goodrich has recently published a paper on the body-cavities of the *Actinotrocha*, and his observations confirm those of Ikeda.

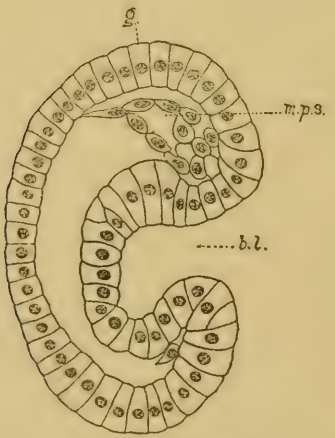
From the above review of the recent literature on the body-cavities and mesenteries of the *Actinotrocha* it is seen that all but Roule, and possibly Caldwell, recognize the

presence of a mesentery between the cavity of the preoral lobe and that of the collar. Longchamps, Ikeda, and Goodrich agree that this structure is incomplete, and the former considers it to be a secondary structure. Menon, and probably Masterman, on the other hand, consider it to be a complete mesentery.

I have studied the two *Actinotrochæ* found in the harbour of Beaufort, North Carolina, and I am inclined to think that one of these is the *Actinotrocha* of *Phoronis architecta*. In both species there is an incomplete mesentery between the preoral lobe and the collar-cavities and a complete one between the collar- and trunk-cavities. The trunk-cavity contains a ventral mesentery, and in one species indications of a dorsal mesentery, but there is no sign of a dorsal mesentery such as Masterman describes for the collar-cavity.

There seems to be more or less inclination on the part of those who have investigated the *Actinotrocha* since the appearance of Masterman's paper to doubt the correctness of the latter's observation as to the five-fold origin of the body-cavities from the enteron.

Fig. 1.



Sagittal section through gastrula of *Phoronis architecta*, × 704. *g.*, ganglion; *b.l.*, blastopore; *m.p.s.*, mesodermal preoral sac.

I do not find that the origin of the mesoderm in *Phoronis architecta* agrees with Masterman's account for *Phoronis Buskii*, nor do I find that the mesoderm arises from archenteric diverticula. My observations agree more closely with those

of Longchamps, but we differ concerning the origin of the lining of the preoral lobe and the lobe-collar mesentery.

As in the form studied by Longchamps, the anterior and lateral borders of the blastopore are most active in giving rise to mesoderm-cells, and in the gastrula-stage, where the blastopore-lips have closed up somewhat, the mesoderm-cells which have arisen from the anterior border of the blastopore become arranged into a definite sac (fig. 1). Later this sac bends around the anterior end of the archenteron, so as to become horseshoe-shaped, and its anterior wall becomes the lining of the preoral lobe, while its posterior wall becomes the lobe-collar mesentery. At this stage the latter is complete, and it remains so until the preoral lobe begins to take on the shape of the hood. The larva of *Phoronis architecta* is an exceptionally favourable one for studying the origin of this mesentery, because of the spacious blastocœl, and there is not the least doubt but that it is a definite structure and that it has not a secondary origin.

In the larva of *Phoronis architecta* the lining of the collar-segment does not arise as it does in the preoral lobe. It has its origin largely, or possibly entirely, from isolated mesoderm-cells, which come from the lateral lips of the blastopore. These cells, however, do not form a complete lining to the collar-cavity, but arrange themselves on the somatic wall, leaving at least the lateral and ventral walls of the stomach free from any lining. This condition continues throughout the life of the *Actinotrocha* (fig. 2). The early stages that we have been considering show no sign of the mesentery which is found between the collar- and trunk-cavities of the fully-formed *Actinotrocha*. In fact, the trunk-segment does not exist at this time.

I am still in doubt as to the origin of the lining of the trunk-cavity and also as to the manner in which the mesentery arises between the latter and the collar-cavity. In larvæ with two pairs of tentacles the trunk-cavity is not present, but in larvæ with the beginnings of four pairs of tentacles it makes its appearance. This stage in the development of the *Actinotrocha* of *Phoronis architecta* is very difficult to obtain, however, and I have never taken but one specimen (fig. 3).

Longchamps has called attention to a figure of a young *Actinotrocha* in Hatschek's 'Lehrbuch' which shows the lining of the trunk-segment arising from two cœlomic sacs. Hatschek does not describe the origin of these sacs, but Longchamps asks whether or not the lining of the trunk-cavity may not arise from part of the "diverticule ecto-blastique" (nephridial pit).

I believe that the cavity of the trunk is formed in the following manner:—As the tentacles grow out and increase in number the posterior region of the larva about the rectum increases greatly in length. In doing the latter the mesodermal lining of the collar is drawn away from the somatic

Fig. 2.

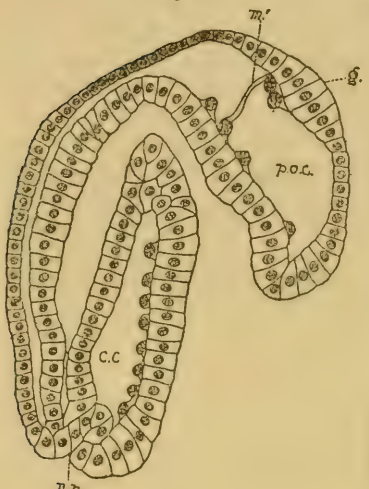


Fig. 3.

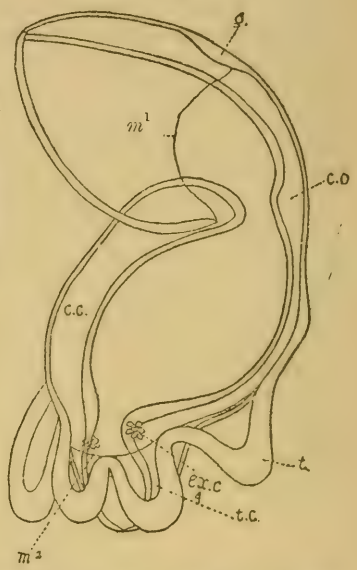


Fig. 2.—Longitudinal section through young larva, not quite sagittal, × 704. *c.c.*, collar-cavity; *g.*, ganglion; $m.^1$, mesentery between lobe- and collar-cavities; *n.p.*, nephridial pit; *p.o.c.*, cavity of preoral lobe.

Fig. 3.—Young larva of *Phoronis architecta*; three pairs of tentacles and beginnings of the fourth pair, × 225. *c.c.*, collar-cavity; *ex.c.*, excretory cells; *g.*, ganglion; $m.^1$, mesentery between lobe- and collar-cavities; $m.^2$, mesentery between collar- and trunk-cavities; *t.*, tentacle; *t.c.*, cavity of trunk.

wall in the region back of the tentacular band, and a cavity is left containing the rectum, part of the stomach, and the proximal part of the nephridial diverticula. At the same time this is taking place certain cells, which may have their origin from the base of the nephridial diverticula, give rise to the lining of the cavity of the trunk. As to the manner of the origin of these cells, I am still in doubt. I have not been able to find two cœlomic sacs which Hatschek has figured, and I have hunted for them in larvæ where the diverticula

are just beginning to form and also in larvæ with two, four, and six tentacles. In one specimen with two tentacles, however, I have found an arrangement of mesodermal cells on the dorsal side of the intestine which seems to be the beginning of a sac; this, however, is not paired. Whether or not this sac and its cavity give rise to the lining and cavity of the trunk I cannot say, for I have found but a single specimen in which this condition exists (fig. 4).

One thing is certain—the fully developed trunk-cavity of the *Actinotrocha* has a distinct mesodermal lining, consisting of a somatic and a splanchnic layer (fig. 5). As far as I know, all *Actinotrochæ* have a ventral mesentery; this tends to support the view that the lining of the cavity of the trunk has its origin in a sac which grows around the rectum and posterior part of the stomach. Whether or not the fact that there is an indication of a dorsal mesentery in the posterior region of some of the fully developed *Actinotrochæ* (fig. 5) has any bearing on the double origin of the cavity of the trunk I cannot say, for I have never seen the very young larvæ of these forms.

Besides the larval body-cavities there is a mesodermal sac discovered by Ikeda, which arises between the mesodermal lining of the collar-cavity and the ventral ectoderm at a rather late stage in the development of the *Actinotrocha* (fig. 5). I have nothing to add to Ikeda's description of this structure, the cavity of which becomes the supraseptal cavity of the adult.

My observations on the fate of the body-cavities and mesenteries of the *Actinotrocha* agree with those of Ikeda. The preoral lobe and the lobe-collar mesentery are lost during metamorphosis, the collar-cavity and its lining become the ring-vessel of the adult, the cavity of the mesodermal sac between the mesodermal lining of the collar-cavity and the ventral ectoderm becomes the supraseptal cavity of the adult, the trunk-cavity, including the cavity of the ventral pouch, is transformed into the infraseptal body-cavity, and the mesentery between the collar- and trunk-cavities becomes the transverse septum of the adult.

Nephridia.—Caldwell was the first to describe the nephridia of the *Actinotrocha*, although earlier investigators saw the bunches of excretory cells at the ends of the nephridial canals. The account which Caldwell gives us is very brief, but he makes the observation that the nephridial canals end blindly within the collar-cavity.

Longchamps's view agrees with that of Caldwell, while Masterman and Menon find that the nephridial canals of the *Actinotrocha* open into the collar-cavity through one or more

Fig. 4.

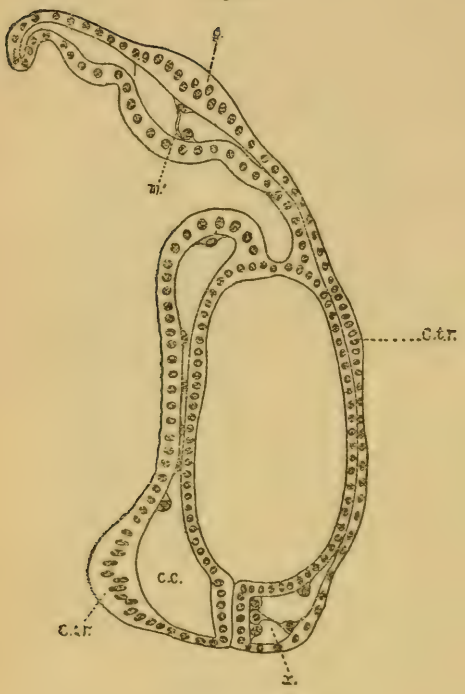


Fig. 5.

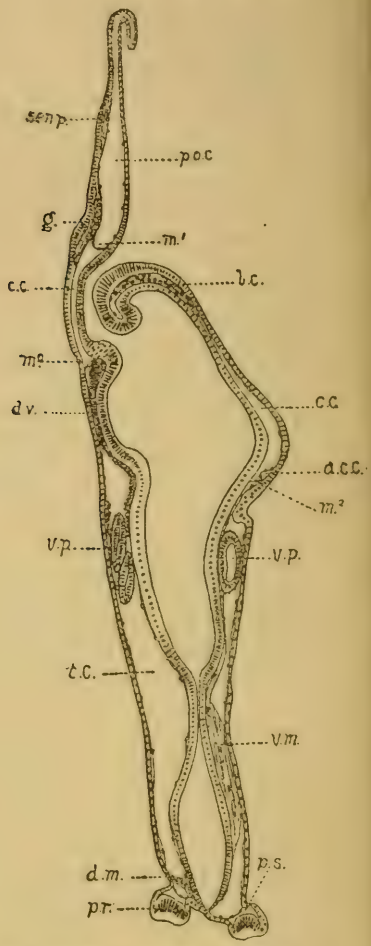


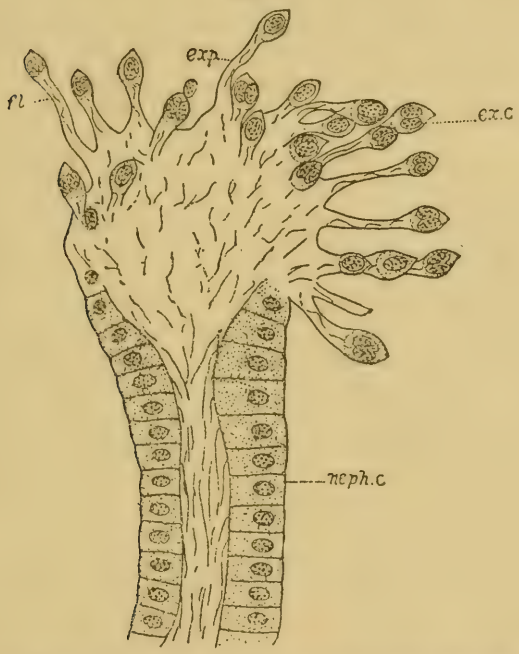
Fig. 4.—Longitudinal section through larva with two tentacles, × 704. *c.c.*, collar-cavity; *c.t.r.*, ciliated tentacular ring; *g.*, ganglion; $m.^1$, mesentery between lobe- and collar-cavities: *x.*, indication of a mesodermal sac.

Fig. 5.—Longitudinal section through an *Actinotrocha* from Beaufort Harbour, × 112. *a.c.c.*, adult collar-cavity; *b.c.*, blood-corpuscles; *c.c.*, larval collar-cavity; *d.m.*, indication of dorsal mesentery; *d.v.*, dorsal blood-vessel; *g.*, ganglion; $m.^1$, mesentery between lobe- and collar-cavities; $m.^2$, mesentery between collar- and trunk-cavities; *p.o.c.*, preoral body-cavity; *p.r.* perianal ring; *p.s.*, perianal sinus; *sen.p.*, sensory papilla; *t.c.*, trunk-cavity; *v.m.*, ventral mesentery; *v.p.*, ventral pouch.

funnels. Ikeda and Roule, on the other hand, tell us that they end blindly.

Goodrich has recently published a paper on the nephridia of the *Actinotrocha,* and has given a very complete and accurate description of their anatomy. My observations on these organs for two different species of *Actinotrochæ* confirm his work in nearly every detail. I find that the nephridial canal does not open by funnels into the collar-cavity, but that it ends in a thin-walled bulb, from the surface of which many thin-walled tubular processes or excretory cells radiate (fig. 6).

Fig. 6.



Longitudinal section through nephridium of an *Actinotrocha* from Beaufort Harbour, × 1200. *ex.c.*, excretory canal; *ex.p.*, excretory process; *fl.*, flagellum; *neph.c.*, nephridial canal.

These are really continuations of the blind end of the nephridial canal, and the lumen of each process is continuous proximally with that of the latter, but distally it is closed by a cell-like structure possessing one or more nuclei (fig. 6, *ex.c.*). Each tubular process contains a flagellum which arises from the cell at the tip of the former. Goodrich claims that there

is but one nucleus at the end of each process, but I find in the *Actinotrocha* of *Phoronis architecta* that there may be two. (This conclusion is not drawn from bent nuclei, although I admit that such exist.)

It is, I think, a fairly well-established fact that the posterior pit (fig. 2, *n.p.*) and its wall become transformed into the nephridial canals of the *Actinotrocha*, and if we assume that the pit is of ectodermal origin, which seems to be the case in *Phoronis architecta,* we may say that the canals are of ectodermal origin. There is still some doubt as to whether the tubular processes or excretory cells arise from the blind ends of the nephridial canals, or whether they represent mesoderm-cells which have become applied to the wall in that region. Ikeda describes such mesoderm-cells, but I have never seen them in the larvæ of *Phoronis architecta*. In fact, all the observations that I have made lead me to believe that the excretory cells arise from the blind ends of the nephridial canals.

The nephridia which Masterman says exist in the preoral lobe are not present in either of the *Actinotrochæ* from Beaufort Harbour, nor are there any nephridia (Masterman now denies the existence of these) in the region of the perianal ring.

During metamorphosis, as Ikeda has described, the excretory cells and a large part of the nephridial canals are lost, and the great changes which take place in the relation of the different parts causes their openings to be brought closer to the anal region. I am not prepared to say, however, that they become the nephridial pores of the adult.

BIBLIOGRAPHICAL NOTICE.

Monograph of the Coccidæ *of the British Isles.* By Robert Newstead, Curator of the Grosvenor Museum, Chester. Vol. I. pp. xii, 220; pls. A–E, 1–34. Vol. II. pp. viii, 270; pls. F, 35–75. London: printed for the Ray Society, 1901 & 1903.

Since the first publications of the Ray Society appeared in 1844, the Society has published a long series of valuable monographs, chiefly, but not exclusively, dealing with the Fauna of the British Islands; and the concluding volume of Mr. Newstead's great work on the Coccidæ has just appeared, under the management of Mr. John Hopkinson, F.L.S., who succeeded to the post of Secretary on the death of Rev. Prof. Wiltshire last year.

The Coccidæ, or Scale-Insects, are extremely destructive in gardens,

orchards, and greenhouses, but within the last few years have been comparatively neglected by entomologists; and before the appearance of the present work almost the only recent information relating to the British species was to be found in papers by Mr. J. W. Douglas and Mr. R. Newstead in successive volumes of the 'Entomologist's Monthly Magazine.' In the exhaustive and beautifully illustrated volumes before us Mr. Newstead deals with eighty-eight British species and four varieties. Many of these are doubtless introduced, for Coccidæ are very liable to be carried from one country to another with plants, to which the gravid apterous females firmly attach themselves, covering their eggs with their own dead bodies, whereas the males are very delicately formed and fragile winged insects.

Outside Europe the Coccidæ have been more especially studied in North America, Ceylon, and New Zealand; and very recently Mrs. Maria E. Fernald, A.M., has published a Catalogue of the Coccidæ of the World, as Bulletin no. 8 of the Hatch Experiment Station of the Massachusetts Agricultural College, in which she enumerates 1514 species. There can be no question but that the existing number of species is very much larger—how much larger it would be futile even to hazard a guess at present.

Mr. Newstead's first volume includes a good deal of introductory matter, under such headings as life-history and metamorphoses; natural products; migration, distribution, acclimatization, &c.; natural enemies; collecting and preserving, methods of prevention and remedies; insecticides, &c.; and the monograph of the subfamily Diaspinæ. The second volume contains the monographs of the subfamilies Conchaspinæ, Lecaniinæ, Hemicoccinæ, Dactylopiinæ, Coccinæ, Ortheziinæ, and Monophlebinæ, four other subfamilies (the Tachardiinæ, Idiococcinæ, Brachyscelinæ, and Margarodinæ) being at present unrepresented in the British Isles.

Many Coccidæ exude a large amount of waxy matter, often taking the form of regular laminæ, as may be seen very conspicuously on the last two plates of Mr. Newstead's book.

All Coccidæ are not injurious, and several foreign species yield valuable products, such as cochineal, wax, and lac; while others yield honey-dew, and some species are domesticated by ants.

PROCEEDINGS OF LEARNED SOCIETIES.

GEOLOGICAL SOCIETY.

April 27th, 1904.—J. E. Marr, Sc.D., F.R.S., President, in the Chair.

The following communication was read:—

'On a New Species of *Eoscorpius* from the Upper Carboniferous Rocks of Lancashire.' By Walter Baldwin, Esq., F.G.S., and William Henry Sutcliffe, Esq., F.G.S.

The specimen described was found in an ironstone-nodule occurring

on a fairly well-marked horizon, about 135 feet above the Royley Mine (or Arley Mine) coal-seam, at Sparth Bottoms, about half a mile south-west of Rochdale Town-Hall. The nodules occur in a band of blue shale, in which are well-preserved remains of *Carbonicola acuta*, ferns, *Calamaria*, *Prestwichia rotundata*, and *Bellinurus bellulus*. The animal is well represented by both the intaglio and relievo impressions: these, however, only show its dorsal aspect. A description of the specimen is given, and it is referred to a new species. Dr. Peach is of opinion that, like the recent scorpions, the ancient species visited the sea-shore in search of the eggs of invertebrates left bare by the tides, and the association of this new scorpion with king-crabs at Sparth Bottoms is in favour of this view. The specimen has been presented to the Manchester Museum.

MISCELLANEOUS.

Note on Hinulia pardalis *of Macleay.*

By G. A. Boulenger, F.R.S.

The lizard which bears this name was so imperfectly described by Macleay in 1877 (Journ. Linn. Soc. N. S. W. ii. p. 62), from a collection made at Katow, New Guinea, that, when revising the Scincidæ in 1887, I could refer to it only in a footnote (Cat. Liz. iii. p. 209) appended to the general synonymy of the genus *Lygosoma*.

I have now received, through the kindness of Mr. S. J. Johnston, of the Technological Museum, Sydney, a specimen collected by Mr. A. E. Finckh on Lizard Island, Queensland, which, he informs me, he has compared with the type of *Hinulia pardalis* in the Macleay Museum, University of Sydney, and found identical with it. From this specimen I conclude that *H. pardalis* is the same as *Lygosoma elegantulum*, Peters & Doria (Ann. Mus. Genova, xiii. 1878, p. 344), and, as the former name has priority, I propose in future to designate this rather common species as *Lygosoma pardalis*, Macleay.

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[SEVENTH SERIES.]

No. 80. AUGUST 1904.

XIII.—*On some Echinothurids from Japan and the Indian Ocean.* By Dr. Th. Mortensen, Copenhagen.

[Plates II.–V.]

In the autumn of 1902 Professor F. Jeffrey Bell sent me six specimens of Japanese Echinothurids, asking me to examine them. I found them to belong to three different genera and species, two specimens of each. One of them proved to be an interesting new species of *Arœosoma*, the two others to be identical with the two species described by Yoshiwara, *Asthenosoma ijimai* and *A. longispinum*, two species as yet insufficiently known, so that I had to leave it undecided in my revision of the Echinothuridæ in the 'Ingolf' Echinoidea * to which genus they should be referred. The collection thus proved to be of considerable interest. Knowing, however, that Dr. de Meijere was about to treat some closely related forms in the 'Siboga' Echinoidea, I thought it better to postpone examining the little collection till de Meijere's work had appeared, and Professor Bell willingly agreed to my proposition. As that eminent work has now appeared, no further delay is needed.

Meantime I have likewise received for examination four specimens of Japanese Echinothurids from the Museum of

* The Danish 'Ingolf' Expedition, iv. 1, Echinoidea, i. (1903).

Hamburg belonging to the new *Arœosoma*-species and to *Asthenosoma ijimai*, two specimens of each. All these specimens, those from Hamburg as well as those from the British Museum, were taken by the same collector, Mr. Owsten, in the Sagami Sea at a depth of 50 fathoms. Further, I found among a collection of Echinids sent me for examination by Professor S. F. Harmer, of Cambridge, some specimens of a hitherto unknown species of *Phormosoma*. Having learnt from Professor Döderlein that this species is not represented among the collections of the 'Valdivia' Expedition, I thought it desirable to describe it also on this occasion. The specimens were taken (1892) by the 'Investigator' in the Bay of Bengal at a depth of 678 fathoms. With the permission of Prof. A. Alcock, Prof. R. Koehler (who will work out the Echinids of the 'Investigator'), and Prof. S. F. Harmer, the species is described here under the name of *Phormosoma verticillatum*, sp. n., the name indicating the most prominent feature of the species, viz. the curious verticillated primary abactinal spines.

The new species of *Arœosoma*, which, according to the wish of Professor Bell, I name *A. Owsteni*, in honour of the collector, is especially interesting on account of its primitive "tetradactyle" pedicellariæ. As regards Mr. Yoshiwara's two species, one (*Asthenosoma ijimai*) proves really to belong to the genus *Asthenosoma* as limited by me in the 'Ingolf' Echinoidea, the other (*Asthenosoma longispinum*) to the genus *Calveria*, and it can even scarcely be doubted that it is identical with *Calveria gracilis* (Agass.).

1. *Arœosoma Owsteni*, sp. n.
(Pl. II. figs. 1, 2; Pl. V. figs. 4–9, 11, 18–20.)

The test is rather flexible, of the usual low form; the edge is rounded, the actinal side flat. (By filling it with spirit through the anal opening under a moderate pressure the test assumes its natural form; a specimen of 140 mm. diameter was thus found to be 65 mm. high.)

The apical area is rather small (24 mm. in the specimen of 140 mm. diameter), of the usual Echinothurid type, the genital and ocular plates being widely separated. The genital plates are rather elongate; the genital openings are large, covered by a distinct papilla; they are situated in the middle of the plate. The madreporic plate is distinctly larger than the other genital plates; the pores do not spread over the neighbouring plates. The genital and ocular plates, as well as the numerous small anal plates, are covered with spines. The inner anal plates not distinctly elongate.

The interambulacral areas are twice as broad as the ambulacral. On the actinal side there is a rather regular series of large tubercles along the outer edge of the area and another more irregular series along the median part of the plates. A large intermediate tubercle is found on the plates near the ambitus, and on all the plates except a few of the adoral ones there are some medium-sized tubercles, forming an indistinct horizontal row on each plate. Several small tubercles are placed between the larger ones; they may be arranged along the inner and outer edge of the plates, but mostly they are irregularly distributed. The scrobicular areas are rather deep, provided along the edge with a circle of small depressions, a feature not known to me in any other Echinothurid. The membranous interstices (the sutures) between the plates are rather large; they can be seen only when the epidermis has been removed; they are directed a little adorally at the inner and outer end (Pl. II. fig. 1). The extension of the lapping of the plates is visible only from the inside of the test, so that, not having opened any of the specimens, I cannot give any particulars. On the abactinal side the tubercles are few, smaller, and quite irregularly placed. The sutures between the plates rise obliquely from the median line of the area.

In the ambulacral areas there is, on the actinal side, a large tubercle on the inner half of the large component, but only on every second plate, or even more distant; these tubercles do not form a very regular longitudinal series. Some smaller tubercles are placed irregularly on the ambulacral plates, at the inner edge or in the outer part, between the pores. The edges of the plates irregular, the plates widening where the large tubercles are placed. On the abactinal side the tubercles are very few and small, irregularly placed. The pores are very conspicuous, forming three rather distinct longitudinal series. Towards the apical area they are more irregularly placed, forming sometimes arcs of four, and it can scarcely be doubted that some of these plates have really four pairs of pores—a fact of no small interest, indicating that also in the family Echinothuridæ multigeminate pores may occur (comp. *Pelanechinus*).

The plates of the actinostome do not present peculiar features.

The primary spines of the abactinal side are evidently rather variable in length; in one of the specimens from Hamburg they are more than 25 mm. long (I have seen none unbroken), in the specimen figured they are more slender and have evidently been shorter; they are smooth and

straight. The secondary spines are provided with a poison-gland at the point. The primary actinal spines are rather short and robust, curved and thorny, ending in a rather large white hoof; those on the actinostome are flattened at the point, without hoof, otherwise thorny as the primary actinal spines. The secondary spines of the actinal side are likewise thorny, but quite small; smooth ones are also found, those near the ambitus provided with a poison-gland at the point. Transverse sections show the primary actinal spines to be almost compact; the abactinal ones are hollow as usual.

The pedicellariæ are of three kinds, viz. "tetradactyle," tridentate, and triphyllous. The tetradactyle pedicellariæ (Pl. V. figs. 4–6), which occur only on the actinal side, are very interesting, being evidently of a rather primitive form. They are three-valved, as is also the case in *A. tessellatum* (de Meijere, 'Siboga' Echinoidea, p. 35); but whereas in the latter species the valves are of the same beautiful highly finished structure as in those of *A. fenestratum* and *coriaceum*, they are here quite irregular, mostly unsymmetrically developed; even the stalk-shaped lower part of the blade is irregularly constructed. At the base of the valves are three rather large glands placed between the valves; they open through a pore at their upper end. The head of these pedicellariæ is a little more than 1 mm. long, the whole length of the pedicellaria being c. 3 mm. They do not seem to occur in one of the specimens from the Hamburg Museum; on the other hand, the tridentate pedicellariæ are very numerous in that specimen.

The tridentate pedicellariæ (Pl. V. figs. 8, 9, 18–20) are of one kind only, all intermediate forms uniting the rather different-looking extreme forms; the large form of tridentate pedicellariæ found in other species of *Arœosoma* is not represented in this species. They are rather variable in size, the largest reaching c. 2·5 mm. (head). In the smaller ones the valves join in their whole length; the edge is strongly sinuate and extremely finely serrate. There is a distinct longitudinal toothed keel in the blade, in continuation of the apophysis, and a meshwork fills out the bottom at the sides of it (Pl. V. figs. 18, 19). In quite small ones the edge is almost straight or with a few indistinct sinuations in the lower part, and the keel is short or wanting. In the larger ones (Pl. V. figs. 8, 20) the valves do not join in their whole length, but are separate for about the lower third part; the keel is indistinct. The neck is short, the stalk of the usual irregular structure.

The triphyllous pedicellariæ (Pl. V. fig. 7) are elongate,

narrow, generally with a series of holes in the median line of the cover-plate.

Sphæridiæ are found on both sides, wanting only on the two or three plates nearest to the apical area. They do not present peculiar features.

The spicules (Pl. V. fig. 11) of the actinal tube-feet are rather large, irregular, thorny, fenestrated plates, arranged in four longitudinal series. The sucking-disk is well developed. The abactinal tube-feet are large and prominent, with neither sucking-disk nor spicules.

The test is of a faint flesh-colour ("incarnatus") *, in two of the specimens rather pale. The spines of the abactinal side are greenish, those of the actinal side whitish; they are not ringed.

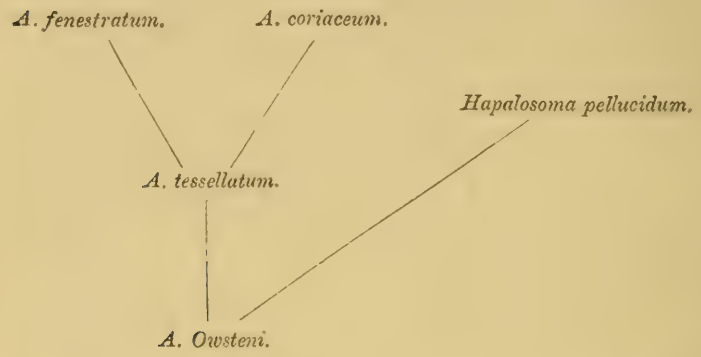
In my work on the 'Ingolf' Echinoidea I stated † that the tetradactylous pedicellariæ must probably be derived from the tridentate ones; de Meijere ('Siboga' Echinoidea, p. 35) thinks it more probable that they are derived from the ophicephalous form. It does not seem to me very probable that they be developed from either of these forms. There is, indeed, nothing in the structure of the tetradactylous pedicellariæ which points in either direction, and I do not see why they cannot represent a special form of pedicellariæ, developed independently of the other forms. By their glands (such are evidently also found in the most developed forms, those of *A. fenestratum* and *coriaceum*) they remind us of the globiferous pedicellariæ in other regular Echinids, and they must certainly be regarded as analogous, if not homologous, with the globiferous pedicellariæ. The form of pedicellaria in *Hapalosoma* described by me in the 'Ingolf' Echinoidea (p. 55) as a primitive globiferous pedicellaria, not seeing its relation to the tetradactylous pedicellariæ, cannot, of course, any longer be regarded as a primitive form, now that the three-valved "tetradactylous" pedicellariæ of *A. tessellatum* and *A. Owsteni* have been made known. As rightly pointed out by de Meijere, it must be regarded as a case of extreme development, in which the valves have become rudimentary and the glands excessively developed.

The form of these curious tetradactylous pedicellariæ shows such gradual changes that it seems reasonable to regard *A. Owsteni* as the most primitive of the species of *Aræosoma*; the fact that the largest form of tridentate pedicellariæ is

* Saccardo, 'Chromotaxia,' ii. ed. (1894).

† According to de Meijere. I am unable to find the place where the statement occurs, but I dare not deny that I really made it.

wanting in this species is in accordance therewith. A more advanced stage is shown by *A. tessellatum*, whereas the exquisite form of tetradactylous pedicellariæ found in *A. fenestratum* and *coriaceum* assigns to these species the highest place in this series of species. The "tetradactylous" pedicellariæ of *Hapalosoma* show this genus to be derived from a form with three-valved "tetradactylous" pedicellariæ, like *A. Owsteni*. The relations of these forms may be graphically shown thus :—



De Meijere ('Siboga' Echinoidea, p. 36) finds in two of his specimens of *A. tessellatum* the small form of tridentate pedicellariæ identical with those found by me ('Ingolf' Echinoidea, p. 52, pl. xiv. fig. 20) in the specimen from 'Challenger' St. 219 referred by Agassiz to *Calveria* ("*Asthenosoma*") *gracilis*; in the other specimens they are like those of the type specimen ('Ingolf' Ech. pl. xiv. fig. 15) : "Es fragt sich da ob dasselbe nicht mit dem erwähnten Exemplar der St. 219 identisch wäre"; he suggests that this specimen is only a badly preserved specimen of *A. tessellatum*. Through the kindness of Professor F. Jeffrey Bell the specimen in question was sent to Copenhagen, so that I have been able to examine it closely, and can give figures of it (Pl. IV. figs. 3, 4). It is a young specimen (30 mm. diameter), without genital openings, not very badly preserved, the structure of the test being even excellently seen; but of pedicellariæ no more can be found than what I have already made known in my 'Ingolf' work; the spines are all broken. The actinal side is like the inner part of the actinal side of the type specimen of *A. tessellatum*, as figured in 'Challenger' Ech. (pl. xix. *a*. fig. 1), with a primary tubercle at the outer end of each interambulacral

plate and only small tubercles on the rest of the plate. The ambulacral plates carry no large tubercles. The abactinal side differs rather strikingly from that of the type (Challenger Ech. pl. xix. *b*. fig. 2), there being a distinct primary tubercle on every second interambulacral plate, forming a conspicuous regular vertical series. The membranous interstices between the plates are distinct; the plates are not obliquely directed, as in the type, but quite regularly horizontal. The same holds good for the ambulacral plates, which have only a few larger tubercles. The pores are arranged as in the type specimen of *tessellatum*. The differences in the test, together with that in the pedicellariæ, would not seem to justify de Meijere's view that it is a young *A. tessellatum*. However, as I have no material of this species, I do not venture to pronounce a definite opinion, but shall be content with giving the above particulars of the specimen in question.

2. *Asthenosoma ijimai*, Yoshiwara.
(Pl. III. figs. 1, 2; Pl. V. figs. 1–3, 10, 12–14.)

Asthenosoma ijimai, Yoshiwara, 1897, "On Two new Species of *Asthenosoma* from the Sea of Sagami," Annotationes Zool. Japon. i. p. 8, pl. ii. figs. 8–12.

The four specimens before me agree very well with the description given by Yoshiwara. Figures are here given of the species from photographs, the figures given by Yoshiwara being rather unsatisfactory. Otherwise I need not add anything to the description of the structure of the test, except of the madreporic plate. According to Yoshiwara it is "divided into four separate pieces of unequal size, the largest occupying the normal position," a feature which he thinks is merely an individual abnormality. It cannot properly be said that the madreporic plate is divided; it is the madreporic pores which have spread over the neighbouring plates, a feature known also in *A. varium* (Döderlein and de Loriol), and upon the whole not very seldom occurring among Echinids. It is seen in all the four specimens, and must thus certainly be regarded as a normal feature.

Of the pedicellariæ, Yoshiwara only says he has found two kinds, "one large and long-headed, the other small, long-stemmed, and trifid"; no figures are given. As in the other species of *Asthenosoma*, only tridentate and triphyllous pedicellariæ occur. Of the tridentate ones I find only two forms, corresponding to the larger and smaller form of the other species of this genus (comp. 'Ingolf' Echinoidea, p. 49). In the larger form (Pl. V. figs. 2, 12) (head up to 2·2 mm.)

the valves are apart, though not so widely as in *A. varium* and *Grubei* (in *A. urens* and *heteractis* * this form of pedicellaria is not known), joining only at the point. The edge of the outer part is a little sinuate, thus faintly indicating the large sinuations found here in the other species (comp. 'Ingolf' Ech. pl. xiv. fig. 7); in the pedicellariæ from the actinal side, however, the sinuations are more developed, but only the outer one on each side, two deep sinuations being never found as in the other species. These pedicellariæ thus afford a very distinct character for this species. The blade is filled with a coarse meshwork; the edge is irregularly serrate, also along the unusually thick basal part; the neck is short. Those found on the abactinal side are green-coloured.

The second form of tridentate pedicellariæ (Pl. V. figs. 1, 13, 14) is more richly developed than in the other species, perhaps on account of the absence of one form; they occur in very different sizes, the larger ones reaching the same size as the first form. The valves are long and narrow, joining in their whole length. The blade is provided with a toothed median keel, and otherwise, especially in the larger pedicellariæ, filled with a coarse meshwork. In quite small ones there is only little meshwork. The edge is finely serrate, straight in the small specimens, with some sinuations in the outer part in the larger ones. These pedicellariæ occur on both sides of the test, those on the abactinal side generally larger and green, like the other form of tridentate pedicellariæ. The neck is well developed.

The triphyllous pedicellariæ (Pl. V. fig. 3) have a long open slit in the cover-plate, as in the other species of the genus, but the form is somewhat different, the outer part being broader than in those species (comp. 'Ingolf' Ech. pl. xii. fig. 18).

The spicules (Pl. V. fig. 10) are somewhat more numerous and a little larger than in the other species, especially towards the sucking-disk. The sphæridiæ continue on the abactinal side almost to the apical system.

The primary actinal spines are almost white, not banded as in the other species of this genus. The abactinal spines are coloured alike in both areas, and in none of them is the enclosing skin annularly constricted. The secondary spines of the actinal side are thorny in their outer half, not "mostly smooth," as stated by Yoshiwara.

"The most prominent feature by which this species can be

* In a specimen of *A. heteractis* just received from Singapore (dredged by Mr. Gad) I find the large form of tridentate pedicellaria to occur. It is quite like that of *A. varium*.

distinguished from all known members of the genus lies in the peculiar arrangement of the primary tubercles," says Yoshiwara. In *A. varium*, however, the arrangement of the primary tubercles is very similar (comp. fig. 2 *a*, pl. 50, of Döderlein, "Echinoidea von Amboina und Thursday Island"*). The essential distinguishing characters of this very distinct species are found in the pedicellariæ and spicules, and the non-ringed primary actinal spines. The little developed, not annularly constricted bag of skin on the abactinal spines is an additional, though probably less reliable, character.

A. ijimai in its general appearance resembles the other species of the genus, with the conspicuous covering of the abactinal side by close-set, ringed, almost equally sized, skin-clad spines.

3. *Calveria gracilis* (Ag.).

Asthenosoma gracile, Agassiz, 1881, 'Challenger' Echinoidea, p. 89, pl. xvii. *a*. figs. 1–4.
Asthenosoma longispinum, Yoshiwara, 1897, *op. cit.* p. 5, pl. ii. figs. 1–7.
Calveria gracilis, Th. Mortensen, 1903, 'Ingolf' Echinoidea, p. 51, pl. xiii. fig. 3; de Meijere, 1904, 'Siboga' Echinoidea, p. 34, Taf. xiii. fig. 152.

The "*Asthenosoma longispinum*" of Yoshiwara so closely agrees with *Calveria gracilis* (Ag.) that I cannot find a single character by which to distinguish it from that species, with which, accordingly, it must be regarded as synonymous. It is only to be remarked that in the type specimen of Agassiz some violet patches are found on the actinal side, which is not the case in the specimens before me. The colour is dark red, almost claret-coloured ("vinosus") in the one specimen, rather pale, but of the same tint in the other.

This species is very closely related to *C. hystrix*; the only distinct difference I can find is the colour, which is always beautifully red ("ruber") in *C. hystrix*. The tubercles of the outer interambulacral plates of the actinal side are rather more numerous than in *hystrix*, as pointed out by Agassiz, a not very prominent feature. In the pedicellariæ no distinct differences are found. The chief peculiarity, indeed, lies in the geographical distribution of the two species. If both were found together they would certainly be regarded, at most, only as varieties of one species.

To the description given by Yoshiwara a few corrections must be made. The larger of the primary ambulacral plates are stated to "consist of three pieces apposed together in a

* Semon's 'Forschungsreisen,' v. 1902; Jen. Denkschr. viii.

transverse row." This is not the case in the specimens before me, and, to judge from the figures given by Yoshiwara, it is doubtless simply due to the breaking of the plates in handling the specimens. A very startling statement is that the teeth are keeled. This would be very curious and unexpected, as all other Echinothurids have unkeeled teeth. The specimens before me, in fact, have unkeeled teeth, and the statement of Yoshiwara is evidently wrong.

I must corroborate the statement that genital papillæ occur in this species, and it may be added that such structures may also be found in *C. hystrix*, though generally little developed. The abactinal tube-feet are unequally developed, those in the inner row being larger than the outer ones.

4. *Phormosoma verticillatum*, sp. n.
(Pl. IV. figs. 1, 2; Pl. V. figs. 15–17.)

This species, as regards general appearance, is very similar to *Ph. placenta*. On the actinal side the large tubercles (and areoles) do not reach quite so close to the peristome as in that species; they are arranged in a broad band along the outer edge of the actinal side, the inner part around the peristome looking more naked, whereas in *Ph. placenta* the large tubercles cover the whole actinal side from the outer edge to the peristome. The marginal fringe of small spines is well developed. The abactinal side of the test is almost exactly as in *placenta*; in the interambulacra the tubercles are generally, but not always, arranged in an arc of three on each of the outer plates; on the uppermost plates the number of tubercles is reduced to two or one, the arc thus disappearing. This arrangement of the tubercles in a more or less distinct arc may also occur in *placenta*, though seldom.

The peristome is rather small, 19 mm. in a specimen of 63 mm. diameter; in a specimen of *placenta* of 66 mm. diameter the peristome is 23 mm. Although there is some variation in the size of the peristome in *placenta*, it is upon the whole undoubtedly somewhat larger in that species than in *verticillatum*. The same fact holds good for the apical system, and to a greater extent; in the specimen 63 mm. in diameter of *verticillatum* the apical system is only 13 mm. in diameter, whereas in the specimen of *placenta* 66 mm. in diameter it is 22 mm. There is a distinct genital papilla, which may, however, also be the case in *placenta*.

The pedicellariæ are quite like those of *Ph. placenta*; the tridentate pedicellariæ are of the short and broad form found in specimens from Davis Strait and the Gulf of Mexico

('Ingolf' Ech. pl. xii. figs. 2, 3). The spicules are rather small, irregular, fenestrate plates, arranged in the lower part of the tube-foot in two distinct series; there is no sucking-disk and no prolongations from the spicules into the partition-wall of the foot (*Ph. bursarium*). The abactinal tube-feet are almost quite destitute of spicules.

The primary abactinal spines, both ambulacral and inter-ambulacral, are very characteristic (Pl. V. figs. 15, 16). In the lower part they are quite smooth; some way out several spread thorns appear, and these soon become arranged in very distinct and rather distant whorls, the part between the whorls being quite smooth. All these spines unfortunately are broken, so that it is impossible to give any idea of their length or of the structure of the point. The spines are straight. These spines afford the most prominent character of the species. In *Ph. bursarium* the primary abactinal spines are curved and smooth, in *placenta* straight and smooth. The secondary spines (Pl. V. fig. 17) are thorny in their whole length, but the thorns are not arranged in whorls. The spines of the actinal side are like those of the other species.

The shape of the test is the same as in *placenta*, but it is more delicate and fragile than in that species. The specimens before me are bleached, only the skin-bag of the primary actinal spines is faintly violet.

This species is evidently nearly related to *Ph. placenta* and *bursarium*, whereas *Ph. alternans*, de Meijere, on account of the different arrangement of the tubercles and its pedicellariæ being provided with a keel, stands more apart. De Meijere ('Siboga' Ech. p. 32) says respecting this species:—"Es scheint mir eine kleine Erweiterung der bezüglichen Diagnose [of the genus *Phormosoma*] mehr erwünscht, als dass ich für diese Art gleich wieder eine neue Gattung errichten würde." I quite agree with de Meijere that the species described by him ought to be referred to the genus *Phormosoma*, for the present at least. If, on the other hand, there should prove to be other species more nearly related to it than to the other group of species, it would probably be justifiable to create a new genus for them. The genus *Phormosoma*, indeed, seems to me so different from the other Echinothurids that I should not be surprised if it eventually proved to form a separate subfamily of the Echinothurids.

De Meijere ('Siboga' Ech. p. 250) finds it a drawback to the new classification given by me in the 'Ingolf' Echinoidea that new species do not always suit the diagnoses of the genera given there, as, e. g., *Phormosoma alternans*. May not

that be a somewhat unjust reproach? The diagnoses of genera must, of course, be made from a comparative study of the species known, and then it has to be left to the authors describing new species to emend the diagnoses if the new species prove the old diagnoses to be too narrow or too wide. Such has always been and will remain the case, as it cannot be demanded that one should guess beforehand the characters of species as yet unknown. It may well be said to be a drawback to our classifications, but it is common to all of them, and not peculiar to my classification of Echinids. When, further, de Meijere says (*loc. cit.*), "Das System führt also zu grosser Zersplittering, was wohl den Vorzug hat, dass nur das sehr ähnliche zusammen bleibt, aber auch den Nachtheil, dass die doch nahe Verwandtschaft mit der abgetrennten Form aus dem Genus-Namen nicht mehr zu erkennen ist," I might remark that it is allowed and desirable to make the new generic names such that they indicate to which old genus the new one is allied—for instance, let the names of Cidarids end in *-cidaris*, those of Diadematids in *-diadema*, &c. The principal object, however, is to get the genera, and above all the species, distinct and clear. The species are the units with which we must work, and when these units are composed of different things—as was the case with several of the Echinid species—much labour will be lost (*e. g.*, on the geographical distribution). The arrangement of the species in genera and the genera in families &c. is of secondary importance, and differences of opinion on this subject are of far less wide-reaching consequences. I may cite, in conclusion, the words of L. Agassiz*:—"Loin d'être nuisible aux vrais progrès de la science, cette multiplication des genres, lorsqu'ils sont établis sur des caractères précis, ne saurait avoir d'autre effet que de rapprocher de plus au plus les espèces que leurs caractères naturels lient le plus étroitement. C'est-là le grand avantage des petits genres, et cet avantage est surtout sensible dans les familles, dont toutes les espèces se ressemblent par leur aspect extérieur et par l'ensemble de leurs caractères."

EXPLANATION OF THE PLATES.

[The microscope used was a Zeiss instrument.]

Plate II.

Fig. 1. *Arœosoma Owsteni*, from the actinal side.
Fig. 2. Same, from the abactinal side.

* Introduction to Valentin's 'Anatomie du genre *Echinus*,' p. x.

Plate III.

Fig. 1. *Asthenosoma ijimai*, from the actinal side.
Fig. 2. Same, from the abactinal side.

Plate IV.

Fig. 1. *Phormosoma verticillatum*, actinal side. Nat. size.
Fig. 2. Same, abactinal side. Nat. size.
Fig. 3. Young *Arœosoma tessellatum* (?). (The *Asthenosoma gracile* of Agassiz from 'Challenger' St. 219.)
Fig. 4. Same from the abactinal side. Actinal side. Nat. size.

Plate V.

Fig. 1. Tridentate pedicellaria, small form, of *Asthenosoma ijimai*. (Obj. *a**, Oc. 3.)
Fig. 2. Valve of tridentate pedicellaria, large form, of *Asth. ijimai*. (Apochr. Obj. 16·0, Comp. Oc. 2.)
Fig. 3. Valve of triphyllous pedicellaria of *Asth. ijimai*. (Obj. AA, Oc. 3.)
Fig. 4. Valve of "tetradactylous" pedicellaria of *Arœosoma Owsteni*, front view. (Obj. AA, Oc. 2.)
Fig. 5. "Tetradactylous" pedicellaria of *Arœosoma Owsteni*. (Obj. *a**, Oc. 3.)
Fig. 6. Valve of "tetradactylous" pedicellaria of *Arœos. Owsteni*, side view. (Obj. AA, Oc. 2.)
Fig. 7. Valve of triphyllous pedicellaria of *Arœos. Owsteni*. (Apochr. Obj. 8·0, Comp. Oc. 4.)
Fig. 8. Valve of tridentate pedicellaria of *Arœos. Owsteni*. (Apochr. Obj. 16·0, Comp. Oc. 2.)
Fig. 9. Tridentate pedicellaria of *Arœos. Owsteni*. (Apochr. Obj. 8·0, Comp. Oc. 2.)
Fig. 10. Spicules of *Asthenosoma ijimai*. (Obj. D, Oc. 1.)
Fig. 11. Spicules of *Arœosoma Owsteni*. (Obj. D, Oc. 1.)
Fig. 12. Tridentate pedicellaria, large form, of *Asth. ijimai*. (Obj. *a**, Oc. 3.)
Fig. 13. Valve of tridentate pedicellaria, small form, of *Asth. ijimai*. (Obj. AA, Oc. 1.)
Fig. 14. Ditto. (Ditto.)
Fig. 15. Part of primary abactinal spine of *Phormosoma verticillatum*. (Obj. AA, Oc. 1.)
Fig. 16. Primary actinal spine, lower part, of *Phormosoma verticillatum*. (Obj. *a**, Oc. 2.)
Fig. 17. The point of a secondary abactinal spine of *Phormosoma verticillatum*. (Obj. AA, Oc. 3.)
Fig. 18. Valve of tridentate pedicellaria of *Arœos. Owsteni*. (Obj. AA, Oc. 1.)
Fig. 19. Ditto. (Ditto.)
Fig. 20. Tridentate pedicellaria of *Arœos. Owsteni*. (Obj. *a**, Oc. 3.)

XIV.—*On a Collection of Mammals obtained in Somaliland by Major H. N. Dunn, R.A.M.C., with Descriptions of Allied Species from other Localities.* By Oldfield Thomas, F.R.S.

Major H. N. Dunn, R.A.M.C., to whom the National Museum was indebted for the interesting collection of Soudanese mammals described last year *, spent the winter and spring in Somaliland, attached to the Abyssinian contingent taking part in the expedition against the Mullah. As usual, he made as good a collection of mammals as was possible under the circumstances, and has been rewarded by finding a considerable number of new forms, which are here described.

Most of the collection was made in Central Somaliland on the red sandy and stoneless Haud, the fauna of which appears to be peculiar in many respects. The vivid reds of such animals as *Herpestes ochraceus perfulvidus*, *Xerus rutilus intensus*, and *Ammodillus imbellis* are a notable feature of the mammalian fauna, as is the reduction in size found in other types, such as the pigmy leopard (*Felis pardus nanopardus*) and Somali wild dog (*Lycaon pictus somalicus*).

Major Dunn has again presented the whole of his interesting and valuable collection to the National Museum.

1. *Galago* sp.

♂. 128; ♀. 127. Fafan, 35 miles east of Harar.

Allied to *G. teng*, Sund.

It is probable that all the members of the *G. moholi* group, including *G. teng*, *G. gallarum*, &c., should be looked upon as local subspecies of one widely distributed species.

2. *Megaderma cor*, Peters.

♂. 134, 135. Gerlogobi.

3. *Felis pardus nanopardus*, subsp. n.

♂ ♀. 40 miles west of Gorahai.

A leopard of the ordinary African desert type, but conspicuously smaller than any other member of the group.

Fur short, hairs of back only about 10 mm. in length.

Coloration as usual in East-African leopards, the general tone pale, the ground-colour along the dorsal area pale buffy

* P. Z. S. 1903, vol. i. p. 294.

or cream-buffy, gradually passing into white on the belly and limbs. Spots small, more or less elongated on the anterior back; rosettes not well-defined or conspicuous. Spotting on limbs extending to the toes.

Skull conspicuously smaller than in any other known leopard, as shown by the measurements given below. Proportions generally similar to the larger forms, but the cranial crests less developed, there being practically no sagittal crest at all, while the upper part of the lambdoid crest is almost sessile on the brain-case, instead of being supported on a long projecting helmet. Zygomata more uniformly expanded, and consequently more nearly parallel, than in *pardus*.

Teeth as usual, except for their smaller size.

Length of flat skin of ♂ 1150 mm., of ♀ (type) 1070; tail, ♂ 650, ♀ 580.

Skulls:—

	♂ (young adult).	♀ (old).	*F. pardus* ♂ (yg. ad.) *.
	mm.	mm.	mm.
Greatest length	166	172	207
Basal length	142	142·5	173
Zygomatic breadth	105	101	123
Nasals, length	41	38	52
„ breadth	24	24	31
Breadth of brain-case	65	62·5	73
Palate length	75	75	92
Basal diameter of upper canine	11	10	15
Horizontal length of p^2	5·5	2·8	5·5
„ „ p^3	14·5	12·5	18
„ „ p^4	21·7	20	26
„ „ m^1	7	6	8·5
„ „ p_3	10·8	9·2	12·6
„ „ p_4	14·5	13·5	18·5
„ „ m_1	15·8	15·2	20

Hab. as above.

Type. Old female. B.M. no. 4. 5. 9. 35.

That a pigmy leopard occurred in Central Somaliland was first noticed by Capt. Johnston Stewart, of the 2nd King's African Rifles, who shot a specimen in the Dolbahanta country during the spring of 1903, and despatched it home to the National Museum. By some accident it never arrived, and almost immediately afterwards Capt. Stewart was killed by the Mullah's troops, and his invaluable services lost to his country.

Later on Major Dunn obtained the two specimens above referred to, but, looking on them as mere sportsman's trophies, did not take the measurements in the flesh. Fortunately,

* From Kenya District, East Africa, presented by Dr. S. L. Hinde.

however, he preserved both the skulls, and, with his usual generosity, has given these and the typical skin of the female to the National Museum.

No described form of leopard at all approaches *F. p. nanopardus* in its diminutive size, unless the animal referred to by Matschie as "*F. pardus minor*" *, from the Soudan, is similar. But as he does not give any description, his name in any case remains a *nomen nudum*.

4. *Felis ocreata*, Gmel.

♂. 142. Gorahai.
♀. 132. Gerlogobi.

5. *Herpestes ochraceus perfulvidus*, subsp. n.

♂. 140. Wardair, north-east of Gerlogobi, Central Somali.
"Sangom."

General colour uniform bright ochraceous on head, body, and outer side of limbs. Fur unannulated, bright ochraceous throughout, except that the extreme bases of the hairs are slaty and the tips are inconspicuously darker. Underfur slightly more rufous than the longer hairs. Under surface dull whitish, not sharply defined laterally, and washed down the middle line with pale tawny. Centre of face tawny ochraceous, a line above eye and another below grizzled whitish, the hairs being here alone finely annulated. Lips, chin, and interramia white. Back of ears dark brown, edged with buffy. Inner side of limbs dull whitish, like belly; upper surface of hands and feet bright ochraceous buff. Middle line of rump tawny ochraceous, passing into intense tawny on the tail, which is wholly of this colour except for the usual terminal black tuft.

Skull as in true *ochraceus*.

Dimensions of the type (measured in the flesh) :—

Head and body 275 mm.; tail 220; hind foot 51; ear 25.

Skull: greatest length 58; basal length 54; zygomatic breadth 34; greatest horizontal diameter of p^4 6·5, of m^2 3·5.

Type. B.M. no. 4. 5. 9. 9. No. 140 as above. Collected 31st January, 1904.

This remarkably handsome mungoose is evidently the representative in the red sandy region of the Abyssinian *H. ochraceus*, and presents the extreme phase of the colour matching the region.

* SB. Ges. nat. Fr. 1895, p. 199.

Intermediate between this extreme and the grizzled buffy of the Abyssinian *ochraceus* are two specimens from Northern Somaliland obtained by Messrs. Atkinson and Peel. Although intermediate, however, they seem to represent so definite a stage in the process of reddening as themselves to deserve a special subspecific name.

Herpestes ochraceus fulvidior, subsp. n.

Fur grizzled as in true *ochraceus*, except along a median area on the back about an inch in breadth, where it is nearly or quite unannulated. Colour of the head, fore back, and sides grizzled ochraceous, darker than in the typical form, of the median dorsal area strong tawny ochraceous, in continuity with the tawny of the tail. Under surface buffy whitish. Arms and legs externally like sides, internally like belly; upper surface of hands and feet pale ochraceous buff. Tail rich tawny, darkening terminally, the tip, as usual, black.

Skull as in *ochraceus*.

Dimensions of the type (measured in the flesh) :—

Head and body 254 mm.; tail 242; hind foot 52; ear 26.

Skull: basal length 54.

Hab. (of type). Mandeira, south of Berbera. Alt. 3500 feet. Another specimen from Abori, near Eik, 5000 feet (*C. V. A. Peel*).

Type. Male. B.M. no. 97. 8. 9. 7. Collected 15th November, 1896, and presented by Dr. A. E. Atkinson.

An additional specimen of this group, from Jifa Medir, not far from Hargeisa (*R. M. Hawker*), is intermediate between *ochraceus* and *fulvidior*, and indicates that these different forms should not be separated specifically, as their striking differences in colour might tempt one to do.

Mr. de Winton * had already referred to the Abori and Jifa Medir specimens under the name of *H. ochraceus*, Gray, which he rightly resuscitated as a distinct species from *H. gracilis*, Rüpp.

6. *Helogale Atkinsoni*, Thos.

♂. 146. Warandah.

7. *Helogale hirtula*, sp. n.

♀. 145. Gabridehari, 60 miles west of Gerlogobi, 7th March, 1904. *Type.*

* Ann. & Mag. Nat. Hist. (7) i. p. 247 (1898), and P. Z. S. 1893, p. 763.

Closely similar to *H. Atkinsoni* in size and appearance, the general colour of exactly the same grey, although more coarsely grizzled. But the fur is longer, coarser, and shaggier, the hairs on the back attaining 18–20 mm. in length, as against 13–15, and the rings on them are broader, especially terminally. Thus in *H. Atkinsoni* each dorsal hair has a black tip of about 1·5 mm. long, succeeded by a white ring of about the same breadth, while in *H. hirtula* the terminal and subterminal bands are each 4–5 mm. in length. The effect of this difference is to make the general grizzling very markedly more coarse than in the finely ticked *H. Atkinsoni*. Head as in *H. Atkinsoni*, but a ring round each eye practically naked. Under surface as in *H. Atkinsoni*, except that the belly has a more strongly marked tendency to rufous. Limbs coloured as in the allied forms, but the ends of the digits, both fore and hind, are abruptly and prominently black to the base of the claws. Tail as in *H. Atkinsoni*, but, as on the body, the hairs are more coarsely ringed.

Skull rather larger than in *H. Atkinsoni*, but similar in details. Teeth decidedly larger throughout, the posterior teeth below conspicuously larger and heavier; the first lower molar in *H. Atkinsoni* is about 2·4 mm. in breadth, while in *H. hirtula* it is about 2·9, a very considerable difference.

Dimensions of the type (measured in the flesh):—

Head and body 230 mm.; tail 166; hind foot (s. u.) 48; ear 18.

Skull: greatest length 51; basal length 46·5; zygomatic breadth 31·5; breadth of brain-case 22; palate length 25·3; greatest diameter of p^4 5·9, of m^2 3·8, of p_4 3·9, of m_1 3·7, of m_2 3.

Hab. and *type* as above.

This mungoose presents a curious problem, for it is so similar to *Helogale Atkinsoni* as to be readily mistaken for it; but the larger teeth, shaggier fur, coarser speckling, and the black digits compel me to consider it distinct. Its occurrence in the same country as *H. Atkinsoni* prevents its having merely subspecific rank.

8. *Lycaon* pictus somalicus*, subsp. n.

♀. 143, 144. Gorahai.

* I may take this opportunity to describe

Lycaon pictus zuluensis, subsp. n.

A small form profusely marbled with white on the back, as well as with yellow and black, which are present in about equal proportions.

Most nearly allied to *L. p. lupinus* of British East Africa, but rather smaller, as shown by the skull-measurements. Fur excessively sparse and short, the hairs of the back only about 10 mm. in length; how far this is seasonal remains to be seen, but no specimens from other localities have such short fur. General colour dark, the black and yellow of about equal extent, more closely and finely marbled than in *lupinus*, where the colours are in larger masses. No white patches on the upper surface of the body. Muzzle and centre of crown black as usual. Occipital dark line not continued through the nuchal yellow patch. Under surface almost naked, except on the throat; black, with indistinct white markings on the throat. Back of ears blackish, some yellowish hairs intermixed on the basal half. Fore limbs marbled black and white. Hind limbs buffy yellow above, the feet black and white, as in *lupinus*. Tail not forming a very thick brush, its short-haired yellow base shorter than the black mesial and white terminal portions.

Fur long and coarse. Back of ears blackish. Coronal black streak prominent, but not passing down the nape. Under surface well-haired black, yellow, and white, the throat black without white hairs intermixed. Limbs marbled with black and pale buffy yellow. Tail with a large white brush, which occupies the greater portion of its length, the yellow basal portion being short and the median black segment almost obsolete.

Skull and teeth conspicuously smaller than in the allied southern forms, scarcely larger than in *L. p. somalicus*.

Skull dimensions: greatest length 192 mm.; basal length 171; zygomatic breadth 119; length of nasals diagonally 66; interorbital breadth 39; breadth of brain-case 65; palate length 93; length of upper carnassial on outer edge 21, of lower carnassial 24.

Hab. Zululand. Type from the Pongola River.

Type. Adult male. B.M. no. 2. 2. 8. 2. Collected 23rd March, 1896, and presented by Col. David Bruce, R.A.M.C. Two other specimens recently presented by C. D. Rudd, Esq.

This south-eastern form of hunting-dog is readily recognizable by its small size and the profuse white marblings of its upper surface. Such white markings as are present in *L. p. venaticus* of Central Cape Colony are quite few and inconspicuous, the general colour above being yellow with some black markings. The Nyasa form, which I assign to the true *L. pictus*, has, like *zuluensis*, the black and yellow in more equal proportions, but there are comparatively few white markings and the size is considerably greater.

In the type specimen the white markings are only present on the posterior half of the back, but in the two presented by Mr. Rudd they extend over the whole upper surface of the body.

It is noticeable that in the type specimen there is no trace of either of the upper anterior premolars (p^1), a tooth present in every other skull in the Museum. The two examples from Mr. Rudd's collection are without skulls.

Skull comparatively small, the teeth also noticeably smaller than in *L. p. lupinus*.

Dimensions of the type (measured in the flesh) :—

Head and body 890 mm.; tail 280; hind foot 193; ear 115.

Skull: greatest length 189; basal length 168; zygomatic breadth 115; length of nasals diagonally 60; interorbital breadth 40; breadth of brain-case 65; palate length 92; length of upper carnassial on outer edge 18·2 (in *lupinus* 21), of lower carnassial 20·7.

Hab. as above.

Type. Old female. B.M. no. 4. 5. 9. 10. Original number 143. Killed 22nd February, 1904.

This local race of the hunting-dog is readily distinguishable from the only named form allied to it, *L. p. lupinus*, by its short fur, smaller size, and smaller teeth. It is also more yellowish in its general colour than average specimens of *lupinus*, although some approach it in this respect. Both specimens are equally short-haired.

The yellow of *L. p. somalicus* is of the buffy tone also found in the Cape *venaticus*, while in *lupinus* it is of a richer and more orange hue.

9. *Mellivora ratel*, Sparrm.

♀. 136. Gerlogobi.
♀. 149. Gorahai.

10. *Xerus rutilus intensus*, subsp. n.

♀. 138. Gerlogobi Wells.

General colour above, of head, body, and outer sides of limbs deep vinaceous rufous, more or less similar to the rufous of the limbs and flanks of the ordinary N. Somali *rutilus* (*dabagalla*), but there is no distinct yellowish dorsal area as in that animal. Hairs of crown and back finely tipped with white. Under surface and inner side of limbs dull whitish, not sharply defined laterally. Face like body, the usual white markings above and below the eye and behind and at base of the ear well defined. Upper surface of hands and feet wholly rufous, little paler than the flanks. Tail rufous at base above and white below, the brush of the usual annulated brown and white.

Dimensions of the type (measured in the flesh) :—

Head and body 226 mm.; tail 155; hind foot 50.

Skull: greatest length 51; basilar length 39; zygomatic breadth 29·7; length of upper tooth series 8·7.

Hab. Red sandy country of Central Somali. *Type* from Gerlogobi Wells.

Type. Old female. B.M. no. 4. 5. 9. 14. Original number 138. Collected 25th January, 1904.

This ground-squirrel differs strikingly from the ordinary Somali form by its wholly rufous colour and rufous feet, that animal having a grizzled yellowish area on the back and white feet. But there are some specimens showing a certain amount of rufous on the feet, and on the analogy of the red mungoose it would seem probable that intermediate links will be found to occur, so that for the present I regard it only as a subspecies.

On the same analogy I think it probable that the N. Somali *dabagalla*, Heugl., will be found to be subspecifically distinguishable from the original Abyssinian *rutilus*.

11. *Gerbillus* (s. s.) *Dunni*, sp. n.

♀. 139. Gerlogobi, 26th January, 1904. *Type.*

A typical hairy-footed *Gerbillus*, of a darker colour than the bright sandy forms hitherto known.

General colour dark sandy fawn, not unlike some of the *Dipodilli*, such as *D. Harwoodi*, Thos. Dorsal area darker, more slaty, but this may be due to the specimen not having attained its full pelage. Supraorbital and postauricular patches well marked. Under surface less thickly haired than usual, pure white, not very sharply defined laterally. Arms wholly within the white area which passes across the shoulder, but some of the hairs on the outer side of the forearms indistinctly buffy; hands pure white; claws longer than in the allied species. Hind limbs externally sandy fawn like the body, the inner aspect and whole of the feet white; soles with the usual hairy cushions of restricted *Gerbillus*, but their proximal halves are naked, the hairy part beginning along the middle line halfway along the metatarsus. Tail of average length, sandy coloured for its proximal half above and below, then blackened and crested above to the delicate terminal pencil, white below.

Skull as usual in this group.

Dimensions of the type (measured in the flesh):—

Head and body 90 mm.; tail 120; hind foot 28; ear 13.

Skull: greatest length 30·3; basilar length 22; nasals 10·7; interorbital breadth 6; palatal foramina 4·7; length of bulla 11·3; length of upper molar series 4·1.

Hab. and *type* as above.

This pretty little gerbille, which I have named after the

donor of the present most acceptable addition to our National Collection, differs from any of its group that I have seen by its darker and less bright sandy general colour. No true *Gerbillus* as now restricted has been described from Somaliland, the nearest being Rhoads's *G. pulvinatus* from Lake Rudolf, which may be distinguished from it by having the whole of the underside of its tail white. The general resemblance of *G. Dunni* to certain species of *Dipodillus* is very noticeable.

12. *Ammodillus* (g. n.) *imbellis*, de Wint.

Gerbillus imbellis, de Wint. Ann. & Mag. Nat. Hist. (7) i. p. 249 (1898).

♂. 137. Gerlogobi Wells.

"In sandy soil close to wells."

Measurements in the flesh :—Head and body 106 mm. ; tail 144 ; hind foot 27 ; ear 15.

Rather richer and deeper rufous than the type, which was collected by Mr. C. V. A. Peel at Gondar. The tail of that specimen having been imperfect, Mr. de Winton could only say of it "tail darker above than below, rather sparingly haired"; but I am now able to record that while it is very sparingly haired proximally, it changes terminally, and has a well-marked brown brush, the hairs of which may attain 8–10 mm. at the tip.

But, in addition, a further study of this gerbille convinces me that it cannot properly be included in any of the genera now recognized among the group, the characters of the skull, as detailed by the describer, especially the unique absence of the coronoid processes to the mandible, and the details of the dentition preventing its inclusion in *Dipodillus*, to which alone its naked soles ally it.



Right upper (A) and right lower (B) molars of *Ammodillus imbellis*.

Its upper molars have respectively three, two, and one separate laminæ, placed very obliquely, without any evidence of the more cuspidate character of the teeth of *Dipodillus*, though younger specimens are needed before they can be accurately described. Below the anterior molar is quite peculiar in shape (see figure B), its narrow anterior lobe and the minute secondary cusps present on its outer side and at its postero-internal angle being without any resemblance to what is found in *Dipodillus* or other members of the Gerbillinæ. The second lower molar has also a minute secondary antero-external cusp.

13. *Mus albipes*, Rüpp.

♂. 124. Harar.

14. *Mus* sp. (multimammate).

♂. 131. Jig-jiga.

15. *Acomys* sp.

♀. 150. Hargeisa.

A pale rufous form perhaps referable to *A. Hunteri*, de Wint.

16. *Acomys mullah*, sp. n.

♂. 123; ♀. 125. Harar.

Size fairly large. Spinous system less developed than usual, the covering of the head, nape, and fore back rather hispid than spinous, markedly less harsh than in the allied species; spines of back about 11 mm. in length. General colour of head, nape, and fore back pale slaty greyish, the spines of the hinder back becoming tipped with fawn-colour or vinaceous buffy; posterior flanks and outer side of hips more uniformly of the latter colour. Under surface and inner side of limbs wholly sharply-defined pure white; outer side of forearms to wrists and legs to ankles grey with a tinge of fawn; hands and feet white. Ears of medium size, much smaller than in *A. dimidiatus*. Tail thinly haired, grey above, white below.

Skull with a very large broad and flat brain-case, the ridges not unusually heavy. Palatal foramina very long, reaching nearly to the level of the posterior fourth of m^1.

Dimensions of the type (measured in the flesh) :—

Head and body 111 mm.; tail 109; hind foot 18; ear 18.

Skull: greatest length 31·5; basilar length 24·6; zygomatic breadth 15; nasals 13; interorbital breadth 5·1;

breadth across parietal crests 13; palate length 15·5; diastema 8·7; palatal foramina 8·5; length of upper molar series 4·8.

Hab. Harar.

Type. Old male. B.M. no. 4. 5. 9. 19. Original number 123. Collected 6th November, 1903.

This spiny mouse seems to differ from any of the described species by its colour and its comparatively non-spinous nape, in which respect it approaches *A. Louisæ* of N. Somali. From the latter, besides its greater spininess, it differs by its much heavier teeth, the breadth of m^1 being in *A. mullah* 1·6 mm. and in *A. Louisæ* 1·3.

17. *Heterocephalus glaber*, Rüpp.

♀. Hargeisa.

18. *Fornarina Phillipsi*, Thos.

♀. 133. Gerlogobi Wells.—Topotype.

(?) ♀. 141. Wardair.

The Wardair specimen is peculiar in several respects, but as it is an abnormally old individual nothing can be done with it until we have further evidence as to the cranial development that takes place with age.

The presence or absence and the time of eruption of the posterior molars in the *Heterocephalus* group are also rendered somewhat dubious by these most valuable specimens, but until further material is available I do not propose to commit myself to an opinion on the subject.

19. *Hystrix galeata*, Thos. (?).

Skull. ♀. 147. Gorahai.

20. *Lepus* sp.

♂. 122. Harar.

21. *Procavia Erlangeri*, Neum.

♂. 141. Harar.—Topotype.

22. *Procavia Brucei somalica*, Thos.

♂. 152, and skull 153. 50 miles south-east of Buroa.

23. *Cephalophus* sp.

♀. 129. Fafan.
Immature. *C. Grimmii* group.

24. *Madoqua Phillipsi*, Thos.

♂. 126, 130. Harar.

25. *Madoqua Guentheri*, Thos.

♀. 135. Gerlogobi.

XV.—*Descriptions of new Genera and Species of New Zealand Coleoptera.* By Capt. T. Broun, F.E.S.

[Concluded from p. 59.]

Group **Otiorhynchidæ.**

Cecyropa alternata, sp. n.

Convex, broadly ovate, opaque, densely covered with small depressed grey and pale slate-coloured squamæ and minute grey setæ; on the thorax these darker scales form an elongated central cross and near each side an irregular curvate mark; most of the elytral disk is also dark; the alternate interstices are, however, marked by numerous oblong grey spots. The general ground-colour is pale castaneous, but the legs and antennæ are usually ferruginous.

Rostrum stout, with a central linear impression and a dark basal spot. *Scrobes* short and well limited. *Scape* covered with white squamæ and slender elongate setæ; *funiculus* shining, with fine grey setæ, second joint obviously shorter than the first, but of similar form, 3–6 moniliform, seventh distinctly larger than the preceding one; *club* short, ovate, articulate. *Thorax* transverse, its sides regularly rounded, but at the base, near each side, there is a constriction which causes an evident gap between that point and the elytra; the base and apex are truncate. *Elytra* distinctly wider than the basal margin of thorax, a little dilated behind the shoulders, gradually narrowed posteriorly, scutellar region slightly elevated; they have series of moderately fine punctures, which towards the apices assume the form of striæ. *Legs* stout, of moderate length, covered with grey scales and

longate setæ; the inner angulation of the anterior is quite acute, the outer lobe covers the basal joint of the tarsus; the second tarsal joint is barely half the width of the broadly lobate third joint.

Underside clothed with flat grey scales and fine setæ. *Prosternum* not deeply emarginate, fringed with setæ. *Front coxæ* not quite contiguous, the middle pair widely separated by the transverse mesosternal lamina, posterior more widely distant.

Male.—Abdomen nearly fuscous along the middle, basal segment nearly double the length of the second, slightly incurved behind and broadly depressed medially, third and fourth combined but little longer than second, with straight well-defined sutures.

Female.—Basal segment unimpressed, the fifth with a large fovea-like depression near each side.

In this sex the dark marks on the thorax are not so well defined, the rostrum is rather longer, and the elytra are less attenuate behind.

This species may be distinguished from *C. lineifera* by the absence of discoidal striæ, by the more bead-like intermediate joints of the antennæ, and by the form of the eyes; these in *C. lineifera* are more rotundate, whereas in this species they are almost truncate in front. No. 1736, *C. macularia*, may be recognized by its short posterior tibiæ.

Length (rostr. incl.) $3\frac{1}{2}$, breadth $1\frac{3}{4}$ lines.

Port Lyttleton.

One of each sex from Mr. J. J. Walker.

Cecyropa discors, sp. n.

Opaque, pale castaneous, densely clothed with yellowish-grey and pale fuscous squamæ; these latter form some very irregular discoidal spots on the elytra, a cross-like mark on the middle of the thorax, and two or three spots near each side.

This species differs from *C. alternata* in being narrower, in having two shallow longitudinal impressions on the rostrum, but none on the head, in having broadly punctate striæ on the elytra, more pronounced posthumeral dilatations, and more rounded and convex eyes. The grey setæ, though short, are rather longer, and the posterior tarsi are more slender.

The *front coxæ* are contiguous; the second ventral segment is larger, it is not depressed, but only somewhat flattened; the suture is much curved in front; and on the fifth there is only a very slight impression at each side.

There is no other species resembling it.
Length (rostr. incl.) $3\frac{1}{4}$, breadth $1\frac{1}{2}$ lines.
Port Lyttleton.
One example. Another of Mr. J. J. Walker's discoveries.

Platyomida brevicornis, sp. n.

Piceous, densely clothed with small, depressed, greyish scales; antennæ and tarsi pitchy red.

Rostrum one fourth shorter than the thorax, with a well-defined central carina. *Thorax* one fourth broader than long, slightly wider near the front than it is elsewhere, longitudinally depressed along the middle, rugose-granulate. *Scutellum* transverse. *Elytra* subovate, broader than thorax at the base, shoulders rather narrow and oblique, sides but little curved; striate-punctate, third and fifth interstices end behind in nearly equal nodosities; there are three smaller ones on each side of the posterior declivity, besides some granular elevations.

This species differs from *P. binodes* as follows:—The antennæ are shorter and thicker, the scape only reaches the middle of the eye, the second joint of the funiculus is just appreciably longer than the first, joints 3 to 7, though longer than broad, are nearly oviform and not at all slender. The thorax is not so rough. The elytra are less uneven above, more narrowed towards the base, and the apices, though not divaricate, are evidently narrower. The eyes are more rotundate, instead of being decidedly longitudinally oval. The insect, as a whole, is less brightly coloured.

Length (rostr. incl.) 6, breadth $2\frac{1}{4}$ lines.
Puysegur Point.
One from Mr. Sandager's collection, forwarded by Mr. Lewis.

Obs.—Another, numbered 5194, has the rostrum slightly broader and feebly bisulcate. Elytra broader, with more nodiform shoulders, their series of punctures more regular and distinct, squamosity more infuscate. The scape reaches the back of the eye. This insect is probably a varietal form.

Tigones dispar, sp. n.

Opaque, subovate, infuscate red, densely squamose, the squamosity variegate, chiefly fusco-testaceous, with three longitudinal dark streaks on the thorax, and irregular, mostly transverse, dark spaces on the elytra, the setæ rather fine, erect, and pale.

Rostrum short, pterygiate, nude at apex, indistinctly carinate. *Thorax* subquadrate, base and apex truncate, its sides very slightly curved; its surface not uneven, the punctuation concealed. *Scutellum* distinct, quite pallid. *Elytra* broader than thorax, shoulders oblique, sides very gently rounded but much narrowed behind, apices simple; they are finely striate, but not obviously punctate.

Legs stout, nearly concolorous, thickly clothed with scales and fine setæ; the posterior tibiæ with two approximated ciliæ at the extremity outside the tarsi, but without any truncate space there. *Antennæ* sparingly hispid; scape gradually incrassate; funiculus as long as the scape, basal joint rather longer and stouter than the second, joints 3 to 6 differ but little from one another, seventh slightly broader than sixth; club large, oviform, and acuminate.

This is much like *T. cuspidata*, but has a rather shorter rostrum, evidently shorter antennæ, so that the scape does not extend beyond the back of the eye; the thorax is more cylindrical, and, moreover, is without the bare basal tubercle and superficial inequalities seen in no. 1220 (*T. cuspidata*).

♂. Length (rostr. incl.) $2\frac{1}{4}$, breadth $\frac{7}{8}$ line.

Invercargill.

My specimen is from Mr. J. H. Lewis.

Catoptes vexator, sp. n.

Subovate, opaque, piceous; densely clothed with variegated squamæ, greyish yellow predominate, whitish ones usually form a slender elongate central patch and broad lateral spaces on the thorax; on the elytra there are many small irregular spots, dark fuscous ones also occur, whilst short, erect, greyish and dark setæ are distributed over the surface; antennæ and tarsi infuscate red.

Rostrum half length of thorax, indistinctly carinate, sparingly hispid at apex. *Thorax* slightly transverse, its sides moderately rounded, without asperities of any kind. *Elytra* wider than thorax at the base, shoulders slightly narrowed, their sides but little curved and very gradually narrowed towards the hind thighs, but behind these the contraction is strongly marked; their rather narrow punctures almost form striæ, the third interstices are slightly elevated throughout, but are scarcely nodose at the summit of the hind declivity.

Antennæ with fine pale setæ; scape gradually thickened, it reaches the back of the eye; funiculus longer than the scape, second joint rather shorter than first, joints 3 to 7

submoniliform, the last transverse and rather thicker than the sixth; club oblong-oval.

Eyes moderately large, subrotundate, and slightly convex. *Ocular lobes* feebly developed. *Corbels* without any apparent truncate surface outside the posterior tarsi, but ciliate there. *Scrobes* almost visible from above, obsolete near the eyes. Terminal ventral segment with an elongate central fovea.

We have no other species exactly like this.

♂. Length (rostr. incl.) 3, breadth $1\frac{1}{8}$ lines.

Ida Valley.

Another of Mr. Lewis's captures.

Obs.—A second example exhibits numerous irregular pitchy-brown spots on the wing-cases and an ill-defined dark space near each side of the throat, and the fifth abdominal segment is unimpressed. The hind body is slightly broader. This probably is the female.

Catoptes egens, sp. n.

Convex, subovate, rufo-fuscous, antennæ and tarsi paler; covered with small, rounded, yellowish-grey scales, and with series of erect grey setæ on the elytra.

Rostrum short, parallel-sided, not ridged, apex setose. *Antennæ* setigerous; scape gradually and considerably incrassate, but not clavate, it attains the back of the eye; funiculus elongate, second joint more slender than the first and nearly as long as that is. *Eyes* oblique, subrotundate. *Thorax* almost as long as broad, moderately rounded laterally, feebly constricted in front, not uneven above, rather finely punctate. *Scutellum* small. *Elytra* oviform, wider than thorax at base, shoulders rounded; their punctuation quite serial, third interstices only indistinctly elevated, without nodosities. *Legs* stout, setose, tibiæ flexuous.

Underside fusco-rufous, head and prosternum with grey scales, the abdomen with grey hairs. The *prosternum* incurved in front. *Ocular lobes* feebly developed. Apical *ventral segment* with a broad fovea-like impression occupying quite half of the width.

Undoubtedly allied to Sharp's *C. brevicornis*, but smaller, without variegation, and with a longer thorax. The eyes differ from those of *C. obliquisignatus* in being more rotundate. *C. vastator* has the rostrum medially carinate and more expanded in front. Its thorax is widest near the front. The third and fifth elytral interstices are nodiform behind.

Length (rostr. incl.) $1\frac{3}{4}$, breadth $\frac{3}{4}$ line.

Ida Valley.

My specimen was found by Mr. Lewis.

Catoptes duplex, sp. n.

Subelongate, dull fuscous, sometimes reddish, densely covered with small depressed rounded squamæ which are either pale or dark brown; occasionally, however, paler ones are interspersed; there are also a few short erect grey setæ; antennæ and tarsi ferruginous, legs often rufescent.

Rostrum and head conjointly about as long as the thorax; the rostrum with two shallow grooves separated by a central carina, lateral ridges indistinct, its apex red, punctate, and nearly nude, there being only a few erect yellow hairs. *Eyes* free, obliquely oval, acuminate towards the front, nearly flat, distinctly facetted. *Antennæ* thinly pubescent; scape slightly incrassate, reaching backwards to behind the eyes; funiculus longer than the scape, basal two joints almost equal, third elongate yet distinctly shorter than the preceding ones; club elongate-oval, articulate. *Thorax* almost as long as it is broad, its sides rounded, widest at the middle; it is moderately convex, without apparent inequalities, and its punctuation is concealed by the squamosity. *Scutellum* small. *Elytra* evidently broader than the thorax at the base, oblong, much narrowed posteriorly; the apices, however, are not acuminate, they are striate-punctate; the third interstices are slightly raised near the base, more so behind, where they terminate in a nodiform elevation on top of the declivity, near which the suture also is a little elevated. *Legs* clothed with a few scales, grey setæ, and slender hairs; tibiæ flexuous, the extremity of the posterior with a very thin space between the ciliæ.

Underside thickly clothed with minute greyish scales and slender decumbent setæ. Prosternum deeply incurved, coxæ contiguous. Basal ventral segment medially emarginate, so that in the middle it is but little longer than the second; both are broadly but only slightly depressed, third and fourth short, the terminal with a median impression.

The male is rather narrower and the broadest part of the thorax is before the middle.

The *ocular lobes* are feebly developed. The *scrobes* are deep in front, but become vague towards the lower part of the eye. The *mandibular scar* is distinct. The soles of the *tarsi* are pilose; the second and third joints of the anterior are, however, more scantily clothed, the third is bilobed.

Length (rostr. incl.) $3\frac{1}{2}$, breadth $1\frac{1}{4}$ lines.

Ida Valley, Otago.

Five examples from Mr. J. H. Lewis.

Obs.—This is one of several species that do not accord

exactly with *Catoptes, Brachyolus*, or *Inophlœus*, but partake more or less the structure and appearance of all three. In order to avoid confusion it will be necessary before long to redescribe these genera and define their limits more accurately; when that is accomplished the aberrant species alluded to above may be referred to new but certainly very intermediate genera. As I have not seen some of these species as yet, and as very few examples of some others are possessed by me, the difficult task must be allowed to stand over at present.

Inophlœus sternalis, sp. n.

Subplanate, elongate, opaque, fusco-piceous; densely covered with minute, depressed, rotundate squamæ of a pale obscure reddish hue, and with series of decumbent pallid setæ; legs, antennæ, and tip of rostrum rufescent.

Rostrum rather shorter than thorax, with a distinct median carina. *Thorax* one fifth broader than it is long, a little rounded and prominent laterally before the middle, base and apex truncate; along the middle of the disk there is a broad impression, which is deepest behind; between this and each side there are two flattened spaces, one near the front, the other at the base; these cause the surface to appear uneven, there is no discernible punctuation; the sides are blackish. *Scutellum* distinct, with ochraceous scales. *Elytra* broader than thorax at the base, about twice as long as they are broad, nearly parallel-sided for two-thirds of their length, humeral angles oblique, apices a little divergent and prolonged, but not acute; the dorsum is flat, with four series of elongate punctures on each elytron; the fifth interstices are gradually raised backwards and terminate abruptly in horizontal nodosities at the summit of the apical declivity; two other nodosities are placed further back and nearer to the suture; the narrow hinder part bears pallid scales; their sides are vertical and have three series of punctures along each.

Legs long and moderately slender. *Tarsi* pilose, third joint deeply lobate. *Antennæ* finely setose; scape gradually incrassate and attaining the back of the eye; basal two joints of the funiculus equally elongate, the following four decrease in length and are nearly oviform, the seventh is almost obconical; club elongate-oval, apparently four-jointed.

The *ocular lobes* are well developed, so that the prosternum seems abruptly emarginate. *Corbels* of hind tibiæ flattened, but with a narrow external space bordered with ciliæ.

When compared with the typical species (*I. inuus*), it will be noticed that the bald triangular apical portion of the rostrum is more distinctly marked off, the eyes are less acuminate in front, the prosternum is more suddenly and deeply incurved, and the basal two segments of the abdomen are relatively longer.

Length (rostr. incl.) 5, breadth 2 lines.

Riverton.

One received from Mr. J. H. Lewis.

Inophlœus discrepans, sp. n.

Subopaque, piceous, covered with small greyish-yellow scales and numerous erect grey setæ; antennæ pitchy red, tarsi infuscate red.

Rostrum one fourth shorter than thorax, feebly tricarinate. *Thorax* only slightly broader than long, moderately rounded laterally; tuberculate-rugose, rufescent, and finely punctured in front. *Scutellum* small. *Elytra* ample, nearly double the width of the thorax, shoulders curvedly narrowed, sides nearly straight but much contracted posteriorly, declivity almost vertical, with somewhat acutely prolonged apices; dorsum slightly convex; the punctures are disposed in series, but at the base the inner two on each elytron form grooves, and there the suture and third interstices are a little raised, the third and fifth interstices at the top of the declivity are nodiform, and below these nodosities the suture is slightly elevated.

Underside fusco-piceous, clothed with inconspicuous scales and grey setæ. Prosternum incurved. Metasternum with a distinct fovea on the middle at the base. Second ventral segment in the middle nearly as long as the first, the suture strongly sinuate, the fifth with an elongate central depression.

Antennæ elongate, finely hispid; scape gradually but only moderately thickened, it reaches the hind margin of the eye; funiculus (exclusive of the four-jointed club) of the same length as the scape, basal two articulations of equal length, third distinctly shorter than second, joints 4 to 7 decrease in length.

Scrobes open above in front, but become vague towards the lower part of the eyes, these latter rounded above, but acuminate below. *Ocular lobes* but little developed and minutely ciliate. Posterior *tibiæ* at the extremity with a narrow truncate space, bordered with two series of ciliæ. Basal joint of the *tarsi* scantily clothed.

Length (rostr. incl.) $4\frac{1}{4}$, breadth $1\frac{3}{4}$ lines.

One from Mr. Sandager's collection, under the number 5392, sent by Mr. Lewis.

Another specimen (no. 5391), sent by Mr. Lewis as the male, is a much narrower *Catoptes*-like insect, having well-developed ocular lobes. Its rostrum is rather longer and even more feebly carinate. The thorax appears narrower and is not obviously rugose. The elytra are almost twice as long as broad, with simple apices, the first and third interstices are only indistinctly raised at the base, the third and fifth are less evidently elevated and nodose behind, and the hind declivity is more gradual. The basal two ventral segments are flattened and the fifth is simple. The basal joint of the posterior tarsi is almost nude underneath and the truncate external surface of the tibiæ is extremely narrow.

Length (rostr. incl.) $3\frac{3}{4}$, breadth $1\frac{1}{4}$ lines.

Inophlœus longicornis, sp. n.

Oblong, moderately narrow, opaque; fusco-piceous, densely clothed with small, round, flat, fusco-testaceous and pitchy squamæ, which, however, do not form definite spots; there are also some coarse setæ, these on the hind body are serial; antennæ and tarsi rufo-piceous.

Rostrum subparallel, slightly expanded at apex, tricarinate, one fourth shorter than thorax. *Antennæ* elongate, extending backwards to the humeral angles, with fine grey setæ; scape rather slender, attaining the back of the eye; funiculus with the basal two joints equally elongate, third and fourth nearly equal, distinctly shorter than the preceding ones, fifth rather smaller than seventh; club elongate-oval, finely pubescent. *Thorax* moderately rounded laterally, widest before the middle, rather more narrowed in front than behind; it is about as long as broad, its surface is irregularly rugose and has a shallow median furrow. *Scutellum* distinct, greyish. *Elytra* oblong, shoulders gently rounded, so as scarcely to exceed the base of the thorax in width, their sides nearly straight, but much narrowed apically; disk nearly plane, with series of punctures, third and fifth interstices moderately elevated and terminating in nodosities on top of the declivity, sutural region horizontally prolonged so as to form a duplicated protuberance, which, however, hardly extends beyond the top of the posterior declivity.

Legs elongate, femora medially incrassate; tibiæ flexuous, anterior mucronate.

Scrobes deep in front, but, owing to the squamosity,

appearing shallow before reaching the lower angle of the eyes. *Ocular lobes* well developed. *Corbels* of posterior tibiæ cavernous, the external truncate surface of moderate breadth and with inner and outer ciliæ. Basal *ventral segment* deeply impressed between the coxæ.

Male.—The basal four antennal joints, though decreasing slightly, are not far from being equal in length; the terminal three are nearly twice as long as they are broad.

Evidently allied to *I. rhesus*, of narrower outline, differently coloured, with longer antennæ and club, smaller elytral punctures, &c. From *I. suturalis* it may be readily distinguished by the more obviously carinate rostrum, narrower hind body, and longer thorax.

Length (rostr. incl.) $4\frac{1}{4}$, breadth $1\frac{3}{8}$ lines.

Dyers Pass, Canterbury.

I am indebted to Mr. H. Suter for my specimens.

Group Cylindrorhinidæ.

Pparchus, gen. nov.

Allied to *Sargon*, the rostrum more expanded in front, yet less so than in *Anagotus*. The *scrobes* become vague behind and are directed to the lower surface. The *eyes* are transverse, almost truncate in front, and rather near the thoracic margin. *Ocular lobes* only feebly developed, but the prosternum is distinctly emarginated. The *scape* is shorter and just touches the front of the eye. The *funiculus* is longer than the scape, the basal two joints are equal and moderately long, joints 3 and 4 are longer than broad, and 5 to 7 are bead-like. *Club* oviform, pointed, and pubescent. The *tarsi* have dense brush-like soles, but with a bare linear space along the middle; their third joint is deeply bilobed. Anterior *coxæ* slightly separated.

In *Phoxoteles* the eyes touch the front of the thorax and the tarsi are narrow, with scantily clad soles. In *Phæophanus* the eyes and scrobes are very similar, but the ocular lobes are well developed and the tarsal vestiture is very scanty.

Pparchus Lewisi, sp. n.

Elongate, piceous, covered with depressed, greyish, rather elongate scales.

Rostrum slightly shorter than the thorax, feebly tricarinate above, its apex with a few yellowish setæ, but otherwise nude, and irregularly punctate. *Thorax* of equal length and breadth, subcylindrical, widest near the front, evidently

narrower behind, and there nearly parallel-sided, apex medially emarginate, base truncate; its surface is uneven, there is a broad longitudinal depression behind the middle, some punctures are visible near the front, but the rest of the sculpture consists of short, irregular, shining rugæ, those near the base are transverse, the others longitudinal; the deflexed sides are coarsely punctate-rugose. *Scutellum* small. *Elytra* oblong, oviform, wider than thorax at base, shoulders rather narrow; the third interstices are distinctly elevated from the base to the top of the posterior declivity, but do not become nodiform there, they being slightly raised nearly as far as the apices; the fifth are also cariniform, but do not extend so far back; the seventh unite with the third at the extremity; between each of these there are two series of ill-defined coarse punctures; the apices are dehiscent, but not projecting.

Underside irregularly punctate, clothed with grey setiform scales. Abdomen elongate, basal segment broadly depressed medially, longer than second, third and fourth moderately short, fifth nearly as long as the preceding two taken together, sixth very short and curvate. *Legs* normal.

Length (rostr. incl.) 8½, breadth 3 lines.

Ida Valley.

The name of its discoverer, Mr. J. H. Lewis, is applied to this fine weevil. The specimen is unique.

Tocris, gen. nov.

Body oblong. *Head* and *rostrum* broad and flat, conjointly as long as the thorax and almost as broad as that is; the rostrum pterygiate at apex. *Scrobes* open above, deep, rather abruptly bent towards the lower surface, but not reaching the eyes. *Scape* straight and gradually incrassate, it attains the back of the eye. *Funiculus* evidently longer than the scape; basal three joints only moderately elongate, the first slightly longer than either of the following two; fourth longer than broad; joints 5 to 7 almost bead-like; club large, oval. *Eyes* distant from thorax and from each other, distinctly facetted, quite transverse, narrow in the longitudinal direction, acuminate below. *Thorax* subquadrate, narrowed behind, base and apex truncate, ocular lobes obsolete. *Scutellum* small. *Elytra* ovate-oblong, a little wider than the thorax at the base. *Legs* elongate, femora moderately clavate. *Tibiæ* mucronate, the posterior without any external truncature at the extremity. *Tarsi* rather narrow, basal three joints distinctly longer than

broad, the third with rather short lobes; their soles almost bare, being only fringed with fine setæ.

Prosternum incurved. *Front coxæ* almost contiguous, the intermediate moderately, the posterior widely separated. *Metasternum* short. *Abdomen* with six segments; the basal, in the middle, nearly twice the length of the second, third and fourth short, fifth nearly as long as the preceding two combined, sixth very short and curvate, sublunate.

In appearance, owing to the thick short rostrum, the typical species approaches some Australian genera (*Psalidura*, *Talaurhinus*, and *Sclerorhinus*, for example), but in structure these are really quite dissimilar. There is no resemblance between it and any other New Zealand form.

Tocris latirostris, sp. n.

Subopaque, black, sparsely clothed with decumbent, slender, grey squamæ; antennæ and tarsi rufo-piceous.

Rostrum rather flat, with a slight cariniform elevation at each side extending from the antennal insertion towards the inner or upper part of the eye, and with a feeble central carina; its surface and sides irregularly punctate and more squamositate than the rest of the body; its apex and the mandibles form a nearly perpendicular face. *Head* short, with an interocular fovea. *Antennæ* sparingly setose, club finely pubescent. *Thorax* broadly rounded laterally at its widest portion, the frontal half, the hinder part is almost suddenly narrowed, has straight sides and rectangular angles; its surface somewhat uneven, there being a longitudinal depression behind the middle and a broad oblique one near each side in front; its punctuation is not very coarse or close, but behind the middle becomes irregular and quite rugose. *Elytra* very little rounded laterally, each with six series of punctures, those near the sides very coarse; the third, fourth, and fifth interstices are a little elevated from the base to the hind declivity, which, however, is not abrupt, but the sides are vertical.

Underside punctate, similar in colour and vestiture to the upper surface. Fifth ventral segment with a broad apical impression.

Length (rostr. incl.) 6, breadth $2\frac{1}{8}$ lines.

Ben Lomond, Lake Wakatipu.

One example found by Mr. G. Howie and forwarded by Mr. J. H. Lewis.

Group **Rhyparosomidæ.**

Pachyprypnus modicus, sp. n.

Pyriform, opaque, fuscous black, covered with greyish-yellow sappy matter and patches of squamiform setæ; antennæ obscure red, tarsi red.

Rostrum strongly arched, feebly grooved or carinate in front, somewhat ridged and thickly squamositate behind, but without well-marked crests; it is gradually but considerably thickened towards the eyes. *Antennæ* clothed with fine brassy setæ; scape clavate, attaining just beyond the middle of the eye; funiculus gradually incrassate, stout, second joint as long as but more slender than first, seventh subquadrate; club red, compact, nearly round. *Eyes* distant from thorax and from each other, most prominent behind. *Thorax* subcylindrical, as long as broad, basal region depressed; with three moderate, longitudinal, setose elevations extending from the apex to beyond the middle. *Elytra* emarginated and closely adapted to the thorax at the base, where they are of the same width; the scutellar area is depressed; they are broadest near the almost vertical posterior declivity; their sculpture indefinite, consisting seemingly of series of coarse distant punctures; they bear several small setose elevations, these, however, are not conspicuous.

Legs stout, coarsely setose; the two hinder pairs of tibiæ gradually expanded, not flexuous, all mucronate.

Considerably smaller than either nos. 762 or 1413, and of peculiarly rounded outline posteriorly. The hollowed portion of the penultimate joint of the hind tarsi is very small, just sufficient for the insertion of the claw-joint; this latter is large, curved, and thickened towards the extremity.

Length (rostr. excl.) $1\frac{3}{4}$, breadth $\frac{7}{8}$ line.

Rangiahua, Hokianga.

I am indebted to Mr. J. W. Graham, a farmer of that district, for the only specimen I have seen.

Clypeorhynchus inophlœoides, sp. n.

Elongate, uneven; opaque, fusco-piceous, irregularly clothed with dull tawny hair-like scales; antennæ and tarsi rufescent.

Rostrum and head equal to the thorax in length, the former indefinitely tricarinate and coarsely punctured, its apical portion nude and distantly punctate. *Eyes* oblique, oviform. *Head* with an elongate central fovea. *Thorax* slightly longer than broad, subcylindrical, widest before the middle, with tubercular sculpture and a deep median furrow. *Elytra* a

little broader than thorax at the base, their length twice that of the breadth; disk somewhat flattened, with a broad impression along each side of the suture; scutellar region also depressed, the surface therefore uneven but without distinct punctures or striæ; the sides are vertical and slightly uneven and gently narrowed posteriorly, on each there are five or six series of distinct punctures; the apical portion is much narrowed and nearly perpendicular, on the top there is a pair of conspicuous nodosities, there is also a smaller one below each of these.

Antennæ slender and elongate, sparingly setose; scape clavate and attaining front of thorax; basal joint of funiculus flexuous and double the length of the elongate following one, third and fourth longer than broad, joints 5 to 7 moniliform; club elongate-oval, terminal joint evidently longer than either of the preceding two. *Femora* slender at base, inflated medially; tibiæ flexuose; tarsi with yellow setæ, their third joint deeply lobed.

The *ocular lobes* are moderately developed, not so much so as in *C. gracilipes*. The *prosternum* is deeply emarginate and very coarsely punctured. The *abdomen* bears a few pale depressed setæ, the basal segment is longer than the second, with the suture incurved, the following two are short, with straight sutures.

This species, owing to its *Inophlœus*-like hind body, is the most remarkable member of the genus.

Length (rostr. incl.) $4\frac{3}{4}$, breadth 2 lines.

Invercargill.

A single specimen received from Mr. J. H. Lewis.

Bæosomus, gen. nov.

Body subovate. *Rostrum* stout, subparallel, nearly as long as thorax. *Scrobes* deep, oblique, extending from near apex to lower part of eyes. *Scape* short, basal half slender, the other strongly incrassate, it attains the eye. *Funiculus* 6-articulate, first joint slender at base, but much dilated apically, about two thirds the length of the other five combined, joints 2–6 short, gradually expanded. *Club* ovate, apparently compact, almost equalling the funicle in length. *Eyes* widely distant above, free from thorax, small and rather flat, transverse. *Thorax* nearly as long as broad, bisinuate at base, more contracted in front than behind. *Scutellum* invisible. *Elytra* subovate, broader than thorax. *Legs* stout. *Femora* clavate, briefly grooved near extremity. *Tibiæ* flexuous, with well-developed apical spurs. *Tarsi*

short, their soles sparsely setose; penultimate joint entire underneath, excavate above. *Claws* simple.

Prosternum deeply incurved, the obtuse outer angles of the emargination representing ocular lobes. *Anterior coxæ* prominent, globose, contiguous, and situated near the hind margin; the intermediate moderately, the posterior widely separated. *Metasternum* short, plane or concave. *Abdomen* narrowed behind, second segment as long as the metasternum, the first much longer; there is a curvate impression between these; third and fourth very short, with deep straight sutures.

In some respects *Bantiades* approaches this genus; it is, however, well differentiated by the strongly dentiform thighs and seven-jointed funicle.

Bæosomus tacitus, sp. n.

Convex, piceous, densely covered above and below with greyish sappy or easily-detached scale-like matter which usually conceals the sculpture.

Rostrum closely and coarsely sculptured. *Thorax* rather broader than long, rounded laterally, somewhat uneven, coarsely and closely punctate. *Elytra* broader than thorax at base, truncate in the male, bisinuate in the female; there are two slight basal elevations on the third interstices and two small ones on the top of the posterior declivity: the other nodiform elevations are still smaller and inconspicuous, the hinder part is nearly vertical; they are regularly striate, and the interstices are strongly transversely rugose; in the female there are series of minute nodules.

Male.—Rostrum thick, slightly arched, almost parallel-sided. Antennæ inserted before the middle.

Female.—Rostrum slightly narrowed and nearly bare in front of the antennal insertion, nearly one third of the whole length.

Metasternum and basal ventral segment flat or broadly impressed.

Length (rostr. incl.) 1–1⅛, breadth nearly ½ line.

Ida Valley.

About a dozen examples from Mr. J. H. Lewis.

Group **Erirhinidæ**.

Philacta maculifera, sp. n.

Subovate, convex, moderately nitid, pale testaceous, covered with decumbent greyish hairs, which on the thoracic

disk are disposed transversely; on the alternate elytral interstices there are some darker oblong spots.

Rostrum elongate and slender, arched, slightly expanded and infuscate in front. *Mandibles* prominent. *Thorax* transverse, rounded laterally, constricted at the base and apex, its punctuation moderately fine and close. *Scutellum* large, albescent. *Elytra* large, broader than the thorax at the base, with rounded shoulders, widest near the middle; there are three finely punctured discoidal striæ on each, beyond these the sculpture consists of series of punctures.

Femora moderately inflated near the middle, but not dentate. *Tibiæ* incurved and quite unarmed, but deeply excavate at the extremity. *Tarsi* pilose underneath; the middle of the third joint, however, is apparently nude.

Prosternum truncate and densely ciliate in front. *Front coxæ* prominent and contiguous, situated at the extreme base of the prosternum; the intermediate moderately separated by the mesosternal process; the posterior widely distant, their cavities extending to the epipleuræ. *Abdomen* slightly convex, basal segment one third longer than the second and medially emarginate behind, third and fourth conjointly longer than the second.

The *antennæ* are more elongate and slender than in the typical species, no. 789; the scape is clavate at the extremity; the basal joint of the funiculus is nearly twice the length of the second, joints 4–6 are transverse; club oval, triarticulate. The elytral striæ are narrower and the punctures are finer and more distant from one another, and the shoulders are less narrowed. The eyes are rotundate, rather large, moderately convex, and quite free from the thoracic margin. The insect is larger, brighter, and more glossy than *P. testacea*, which, moreover, is unspotted.

Length (rostr. excl.) $2\frac{1}{2}$, breadth $1\frac{3}{8}$ lines.

Port Lyttleton.

Three examples from Mr. J. J. Walker.

Oreocharis ferruginea, sp. n.

Elongate, subopaque, brick-red, dorsum covered with fulvescent squamæ; on the elytral disk numerous erect pallid setæ occur, but on the sides and on the legs the setæ are greyish and more slender; the side of each elytron is nearly nude and red, so as to form a marked contrast to the upper surface.

Rostrum stout, subparallel, punctate, nearly nude, with an indistinct central carina. *Mandibles* somewhat prominent.

Head broader than the rostrum, punctate. *Eyes* rotundate, convex, widely separated above, and distant from the thorax. *Scape* flexuous, slender at base. *Funiculus* not longer than the scape, basal joint evidently largest, the following two longer than broad, joints 4–6 small and moniliform; *club* nearly as long as the funicle, elongate-oval, its basal articulation two or three times longer than the preceding sixth joint, the second still larger, third apparently entire and about twice the length of the preceding two taken together. *Thorax* slightly narrowed and constricted anteriorly, base and apex truncate, the length and breadth about equal, punctate; on some places individual scales are wanting, thus causing an almost maculate appearance. *Scutellum* elongate. *Elytra* elongate, nearly twice the width of the thorax at the base, moderately narrowed behind; the red sides are punctate-striate, but the discoidal portion, though punctured, does not exhibit well-marked striæ. *Femora* moderately inflated, the front pair emarginate near the extremity, the others strongly angulated.

An easily recognized species, owing to its bright coloration and rather large size.

Length (rostr. excl.) $2\frac{5}{8}$, breadth 1 line.

Nelson Mountains.

One mounted specimen kindly sent to me by Mr. G. V. Hudson.

Oreocharis pullata, sp. n.

Nitid, pitchy black, knees and tarsi castaneous, thinly clothed with inconspicuous cinereous pubescence.

Rostrum longitudinally finely punctate-rugose. *Thorax* about as long as it is broad, its sides a little rounded, distinctly constricted near the apex, moderately coarsely and closely punctured. *Elytra* evidently wider than the thorax at the base, rather gradually narrowed posteriorly, striate-punctate, the striæ distinct towards the apices; interstices finely punctured, on some parts appearing slightly rugose. *Legs* elongate, middle and hind femora strongly angulated underneath; posterior tibiæ incurved.

Somewhat similar to *O. cyanea* (no. 1267), but with a longer rostrum, without any interocular impression, and with more distinct elytral sculpture and more prominent shoulders.

Length (rostr. excl.) 2, breadth $\frac{7}{8}$ line.

Nelson Mountains.

A single mounted example, received from Mr. G. V. Hudson.

Group Scolopteridæ.

Gonoropterus, gen. nov.

Body squamose. *Rostrum*, in repose, extending to middle coxæ. Scrobes beginning near apex and extending towards lower part of eyes. *Head* twice width of rostrum. *Eyes* large, rather flat, rounded above, somewhat angulate below in front. *Thorax* longer than broad, narrowed anteriorly, bisinuate at base, armed in front with two stout, horizontal, spiniform processes. *Scutellum* distinct. *Elytra* broader than thorax, humeral angles with large, obtuse, horizontal angulations, apices acuminate, the disk with two large prominences. *Legs* normal; anterior *femora* simple, the intermediate and posterior with spiniform angulations underneath; hind *tibiæ* flexuous.

The genus must be placed near *Ancistropterus*; it most nearly resembles *A. pilosus*, but differs therefrom in having a broader rostrum, large, depressed, and quite lateral eyes, acuminate or spiniform elytral apices, and more especially in having prominent thoracic spines; this last character, indeed, differentiates it from all the genera of the Scolopteridæ.

Gonoropterus spinicollis, sp. n.

Piceous, a little nitid, legs and antennæ rufo-castaneous; clothed with variegated scales, on some parts these resemble the derm in colour, on others they are dull grey and inconspicuous, but for the most part, particularly on the sternum and femora, they are sordid yellow; in shape, too, the squamæ differ, some being minute and rounded, whilst others are slender and elongate; they are depressed, and do not apparently form spots or bands, though perfect specimens may be better marked.

Rostrum finely quadricarinate, but with the apex smooth and somewhat expanded. *Thorax* rather finely and irregularly punctured. *Elytra* coarsely striate-punctate; near the base, however, the sculpture is nearly obsolete; the discoidal tubercles are large and directed outwards as well as upwards; in line with these, but a little further back, there are two slight, elongate, nodiform elevations, and on each of the fifth interstices, towards the extremity, there is a similar small elevation; the sides from the humeral angulations backwards are vertical or somewhat inflexed. *Tarsi* pilose, their penultimate joint short and lobate. *Claws* not dentate.

Length (rostr. excl.) 3, breadth $1\frac{1}{2}$ lines.

Wanganui.

Described from an old imperfect specimen, marked A, which was given to me by Mr. Marshall many years ago. As no other example has been found since then, I thought it advisable to describe it.

Group **Cryptorhynchidæ.**

Crisius dorsalis, sp. n.

Variegate, piceous, rostrum and legs reddish.

Rostrum stout, nearly as long as the head and thorax, its base with rufescent squamæ, the sculpture linear, but finely punctate at the extremity. *Thorax* slightly transverse, its apical third constricted and bearing a pair of small obtuse crests, the basal portion closely and coarsely punctured and nearly covered with red scales, there being only a few ochraceous ones near each side; there are two median squamose elevations in front and two smaller ones near the base, which therefore appears as if it were longitudinally depressed; its sides are a little uneven. *Scutellum* invisible or very minute. *Elytra* broader than the thorax at the base, much narrowed posteriorly; each shoulder has an oblique oblong elevation; there are seven unequal nodosities along each side, the fifth and sixth are small, the seventh is placed near the apex; on the dorsum there are several nodosities of variable size, the squamosity is chiefly ferruginous, but the flattened basal median area is covered with minute pallid scales; on this pale portion and along the hind slope there are four series of punctures which almost form striæ behind; the external punctuation is interrupted. *Legs* squamose, the tibiæ with pale outstanding setiform scales.

This is smaller than *C. obesulus*, Sharp, and may be distinguished therefrom by the coarse thoracic punctuation, obsolete scutellum, less dentiform femora, coarsely uneven elytral margins, contracted posterior portion, and by the pale flattened space.

Length (rostr. excl.) 2, breadth $1\frac{1}{4}$ lines.

Forty Mile Bush.

Described from a specimen which was found by Mr. H. Suter.

Group **Cossonidæ.**

Pentarthrum crassellum, sp. n.

Subcylindrical, moderately shining, rufo-piceous, bearing many minute grey hairs, which on the posterior declivity

become yellow and more obvious; antennæ and tarsi pitchy red.

Rostrum quite cylindric, stout, moderately finely but distinctly punctate, more coarsely and rugosely between the prominent eyes; these latter are sharply limited by the large smooth neck. *Thorax* quite one third longer than broad, rounded towards the base, a good deal narrowed anteriorly, abruptly constricted there; its surface is coarsely and moderately closely punctured, but more finely and closely near the apex. *Scutellum* distinct, rounded. *Elytra* parallel-sided; the hind slope, however, is somewhat contracted, so that the lateral margins there seem expanded; there is a distinct sutural notch at the apex; they are punctate-striate, the punctures are close and coarse, so that the striæ appear crenate, the interstices bear fine serial punctures. *Antennæ* normal, basal joint of the funiculus evidently larger than the second, club rather narrow and pubescent.

P. porcatum, Sharp (no. 2198), may be readily separated by the absence of hairs and interstitial punctures. From the female of *P. punctatissimum* (no. 2194) it is distinguished by the darker colour, larger size, more distinctly punctured rostrum, more coarsely but less rugosely sculptured thorax, larger scutellum, deeper and more coarsely punctured elytral striæ, and narrower antennal club. The other allies of the *P. sculpturatum* group, with each of which it has been compared, present more or less obvious differences.

Length (rostr. incl.) nearly 2, breadth $\frac{1}{2}$ line.

Picton.

A single female, found by Mr. J. J. Walker.

Hectæus, gen. nov.

Body elongate. *Thorax* ovate-cylindric. *Elytra* elongate-oblong. *Scutellum* absent. *Legs* long. Anterior *tibiæ* without hooks, but acute at the apices. *Tarsi* rather short, third joint bilobed but not expanded, the terminal about equal in length to the preceding three combined, with two claws. *Antennæ* finely setose, long and stout, inserted above at the apex of the rostrum. *Scape* slightly flexuous, gradually incrassate, attaining the thoracic margin. *Funiculus* as long as the scape, 7-articulate, basal joint longest, second slightly longer than broad, third and fourth subquadrate, seventh transverse, slightly broader than its predecessor; club ovate, compact. *Eyes* absent or abortive, not visible.

Prosternum elongate, emarginate; front *coxæ* prominent, slightly separated, placed near the basal margin; the inter-

mediate pair distinctly, the posterior widely distant. *Metasternum* short. *Abdomen* elongate, basal two segments broadly impressed, the first longest, third and fourth moderately short, with deep straight sutures.

The *rostrum* is about half the length of the thorax, and is almost pterygiate at the apex, so that the scrobes are quite open above and somewhat similar to those of an *Otiorhynchus*. As the insect is blind and without the scutellum and the tibial hooks, its position in the section having a seven-jointed funiculus is apparently unique.

Hectæus rubidus, sp. n.

Body moderately convex, a little nitid, ferruginous; antennæ and tarsi testaceous; its clothing consists of a few erect slender grey hairs.

Rostrum with some slender pallid squamæ near the base. *Thorax* almost nude, not twice as long as it is broad, slightly wider before the middle than elsewhere, its sides gently rounded, its surface moderately coarsely but not closely punctured. *Elytra* rather wider than thorax at the base, twice its length, their sides nearly parallel, apices simple, rounded; distinctly and moderately coarsely striate-punctate, interstices rather narrow, plane, each with a series of minute punctures; they bear numerous erect, short, grey setæ. *Legs* finely setose; femora long and somewhat clavate; tibiæ stout, a little flexuous, the intermediate and posterior unarmed at the extremity. *Metasternum* and basal ventral segments distinctly but not closely punctate.

Length (rostr. incl.) 1, breadth $\frac{1}{4}$ line.

Ida Valley, Otago.

One example found by Mr. J. H. Lewis.

Group **Scolytidæ**.

Mesoscolytus, gen. nov.

Body narrow, cylindrical. *Head* deeply immersed in the excavate pronotum. *Antennæ* implanted close to the eyes, basal joint curvate, elongate, twice the length of all the others combined; second stout, triangular; remaining joints gradually expanded, extremely short, and so closely articulated as to be almost indistinguishable. *Club* large, flattened, and compact, broadly oval, not visibly articulated above. *Eyes* depressed, distinctly facetted, strongly transverse, widely distant. *Thorax* large, without lateral margins. *Scutellum* small. *Legs* slender, femora laterally compressed;

tibiæ slender at base, expanded beyond, minutely denticulate externally, the two front pairs obliquely truncate at the extremity, the posterior obliquely rounded. *Tarsi* filiform and slender, not as long as the tibiæ, the basal three joints elongate and nearly equal, third not lobate, and interposed between it and the elongate terminal joint there is a minute but distinct fourth joint.

Front coxæ large, prominent, almost contiguous, the intermediate and posterior just perceptibly separated. *Abdomen* rather longer than the metasternum, its segments with straight sutures, that between the basal two very fine, the others deep; the segments are horizontal and on the same plane, the first is distinctly longer than the second, the third and fourth are nearly equal to one another, but shorter than the preceding one.

In *Scolytus* the general form may be termed stumpy, the anterior tibiæ terminate in prominent curvate hooks externally, the elytra are quite truncate at the apex, and the abdomen is retracted and suddenly bent upwards, so that the metasternum is abruptly prominent. In the genus here described the tibiæ are unarmed at the outer extremity, the ventral segments are horizontal and are contiguous with the epipleuræ throughout. *Tomicus* more nearly resembles this genus in contour, but the eyes are emarginate and the posterior portions of the elytra are either truncate or excavate and spinose.

Mesoscolytus inurbanus, Broun.

Cylindrical, slightly nitid, rufo-piceous or nigrescent, sparingly clothed with erect, slender, yellowish hairs; legs and antennæ testaceous or pale castaneous.

Thorax longer than broad, base truncate, its rounded anterior portion transversely punctate-rugose or granulate, its appearance depending upon the direction from which it is examined: the basal part is finely and distantly sculptured and the middle of the disk is somewhat elevated. *Elytra* with three or four ill-defined striæ near the apices, but on the dorsum with series of moderately fine punctures, interstices simple. *Scutellum* smooth. The *antennal club*, though palette-like above, is feebly articulated underneath, the bald basal joint being as long as the three pubescent terminal ones.

Underside shining, brownish black, sparingly clothed with elongate but extremely slender greyish hairs. Flanks of prosternum finely punctured. Metasternum convex, almost

smooth, but with a short furrow behind along the middle. Ventral segments finely punctate, but without other marks.

Length $1\frac{1}{2}$, breadth $\frac{1}{2}$ line.

Clevedon.

The unique damaged specimen found about thirty years ago at Tairua (no. 629) was referred to *Apate*, but the capture of two more recently on the Hunua Range enables me to define the position of the species more accurately, so I thought it advisable to redescribe it.

Group **Lamiidæ**.

Somatidia testudo, sp. n.

Convex, moderately elongate, slightly nitid, rather sparsely pubescent, rufo-fuscous; the base, sides, apex, and a post-median fascia of the elytra fuscous.

Thorax transverse, its greater portion rounded laterally, widest at the middle, much narrowed, almost constricted, near the base; its surface is moderately coarsely and irregularly punctured except on a large triangular discoidal space, which is quite smooth; its clothing is yellowish, decumbent, and scanty, but more concentrated before the scutellum. *Elytra* rather elongate, broadest before the middle; their pubescence is very fine, depressed, and ash-coloured, there are also numerous short, erect, reddish setæ; the punctuation is coarse and irregular, there is a slight longitudinal elevation on each near the base, but no other inequalities.

Antennæ stout, shorter than the body, reddish, pubescent, joints 4–11 more or less infuscate, third joint longest, about one third longer than fourth. *Femora* stout, infuscate; tibiæ and tarsi testaceous, the former with a brown spot near the extremity, their basal portion also infuscate.

Abdomen fuscous, very gradually narrowed backwards; segments 1–4 slightly diminish in length, fifth longer than the preceding one; its covering consists of depressed cinereous hairs.

The smooth shield-like space on the thorax and the rather scanty inconspicuous pubescence render its recognition a comparatively easy matter.

Length $2\frac{3}{4}$, breadth $1\frac{1}{8}$ lines.

Otago.

One from Mr. Sandager.

Auckland, New Zealand,
15th March, 1904.

XVI.—*Descriptions of Three new Marine Fishes from South Africa.* By C. Tate Regan, B.A.

Scyllium natalense.

Allied to *S. quagga*, Alc. Head broad, depressed; snout elliptical, with obtusely pointed tip, its length, measured from the middle of the upper jaw, slightly more than $\frac{1}{2}$ its greatest breadth and equal to $2\frac{2}{3}$ times the width of the interspace between the nasal valves. Diameter of eye $\frac{2}{3}$ the length of snout. A fold at each angle of the mouth, extending along the lower jaw for $\frac{2}{5}$ of the distance from angle to symphysis and less than $\frac{1}{2}$ as far along the upper jaw. Teeth tricuspid, the middle cusp the longest. First dorsal originating above posterior $\frac{1}{3}$ of base of ventral, second dorsal a little in advance of posterior end of base of anal; dorsal fins subequal, the length of the base of each about $\frac{2}{5}$ of the distance between them. Length of base of anal $1\frac{1}{2}$ times that of second dorsal and $1\frac{2}{3}$ times in its distance from the caudal. Pectoral extending a little more than $\frac{1}{2}$ the distance from its base to origin of ventral; ventral with its outer edge evenly rounded anteriorly and becoming very oblique posteriorly. Greyish; back with broad transverse brown bands with darker edges and with less distinct intermediate bands composed of brown marbling or reticulations. Upper surface of head covered with reticulations, except for the first cross-band, which lies between the posterior halves of the eyes and has a convex posterior edge. The second band is represented by 2 oval patches at the level of the gill-openings, nearly meeting in the middle line; the third is at the level of the posterior part of the pectoral; the fourth, in front of the dorsal fin, is broken up into a median circular or oval and a pair of lateral semioval patches; the fifth and seventh are through the bases of the dorsal fins, and there are 2 or 3 on the tail. Pectoral and ventral each with a large dark blotch; each dorsal fin with a dark blotch on its upper portion.

Total length 325 mm.

Two specimens from the coast of Natal, presented to the British Museum by Mr. J. F. Quekett.

Trigla Queketti.

Depth of body $5\frac{1}{3}$ times in the length, length of head $3\frac{2}{3}$ times. Snout $1\frac{1}{2}$ times as long as eye, the diameter of which

is $3\frac{3}{5}$ times in the length of head. Præorbital ending in 2 spines anteriorly; depth of suborbital equal to diameter of eye; maxillary extending to below anterior edge of eye; interorbital space slightly concave, its width $\frac{3}{4}$ the diameter of eye. Dorsal IX, 19; the second spine the longest, $\frac{5}{7}$ the length of head. Anal 18. Pectoral and ventral extending to origin of anal. Caudal very slightly emarginate. About 95 scales in a longitudinal series and 27 plates along the bases of the dorsal fins; scales of the lateral line not enlarged and not spiny. Greyish; pectoral blackish, except at its upper and lower margins; other fins immaculate.

Length to base of caudal 260 mm.

A single specimen from the coast of Natal, presented to the British Museum by Mr. J. F. Quekett.

Petalichthys, gen. nov.

Closely allied to *Scombresox*. Body elongate, strongly compressed. Both jaws produced into a long slender beak; a series of small pointed teeth in each jaw; palate toothless; gill-openings very wide; gill-rakers moderate. Scales small, deciduous; lateral lines approximated ventrally, ending above the last rays of anal. Dorsal with 18 rays, elevated anteriorly, the posterior rays short, subequal, strongly branched, but not disconnected. Anal with 22 rays, commencing in advance of the dorsal and similar to it. Pectoral short, of 11 rays. Ventrals close together, 6-rayed, inserted far back. Caudal forked.

Petalichthys capensis.

Depth of body about $15\frac{1}{2}$ times in the length, length of head about $3\frac{1}{5}$ times. Snout, measured from anterior edge of eye to tip of upper jaw, $2\frac{1}{2}$ times as long as rest of head. Lower jaw projecting beyond the upper; maxillary completely hidden beneath the præorbital. Diameter of eye greater than interorbital width and $\frac{1}{2}$ the length of postorbital part of head. About 22 gill-rakers on the lower part of anterior arch, the longest $\frac{1}{3}$ the diameter of eye. Length of pectoral nearly equal to depth of body. Origin of ventrals equidistant from posterior part of pectoral and base of caudal. Silvery; darker above.

Length to base of caudal 320 mm.

A single specimen from Port Elizabeth, presented to the British Museum by Mr. Drege.

Such an examination of the pharyngeals as is possible without injury to the specimen shows that they are apparently similar to those of *Scombresox*, whilst the middle and posterior dorsal and anal rays are of the same type as the ray immediately preceding the first finlet in the dorsal and anal fins of *S. saurus*.

XVII.—*On the Affinities of the Genus* Draconetta, *with Description of a new Species.* By C. Tate Regan, B.A.

In 1903 Jordan and Fowler (Proc. U.S. Nat. Mus. xxv. p. 939) instituted a new genus, *Draconetta*, for a single species, *D. xenica*, known only from one example of $2\frac{1}{2}$ inches, taken at a depth of 100 fathoms in Suruga Bay, Japan. This genus was made the type of a distinct family, regarded as allied to the Callionymidæ.

In the British Museum collection there is a *Draconetta*, received from the Smithsonian Institution as *Callionymus himantophorus*, Goode and Bean, and stated to have been dredged in the North Atlantic, and which is described below under the name *D. acanthopoma*.

An examination of this example seems to leave no room for doubt that *Draconetta* is closely allied to *Harpagifer*, which genus it resembles in the naked body, the position of the fins, the restricted gill-openings, &c., and in having the operculum and suboperculum reduced and each represented by a strong spine. In *Draconetta*, as in *Harpagifer*, there is a single nostril on each side situated at the apex of a tubular papilla; other apertures which have the appearance of nostrils are the pores of the sensory canal system, which is well developed on the head.

Draconetta differs from *Harpagifer* in the more slender body, the complete absence of a lateral line, the large contiguous eyes, and the more pungent dorsal spines.

Harpagifer has been placed by Boulenger in the Nototheniidæ, and after re-examination of the skeletons it appears to me beyond doubt that it is closely related to *Notothenia*; consequently the family Draconettidæ should be given up.

Draconetta acanthopoma, sp. n.

Depth of body $5\frac{3}{4}$ times in the length, length of head $3\frac{1}{5}$ times. Eyes large, contiguous, their diameter $\frac{2}{5}$ the length

of head. Maxillary extending to below anterior $\frac{1}{5}$ of eye; length of snout $\frac{1}{2}$ the diameter of eye. Dorsal III, 14, the first and second spines close together, the third more remote; the first and third subequal, half the length of the second, which is $\frac{3}{4}$ the diameter of eye. Anal 13. Pectoral and ventral extending to second or third ray of anal. Caudal rounded. Uniformly olivaceous, fins pale.

Length to base of caudal 70 mm.

Easily distinguished from the Japanese species by the form of the spinous dorsal and the more numerous rays.

XVIII.—*New Species of Indo-Australian and African Heterocera.* By Col. Charles Swinhoe, M.A., F.L.S., &c.

Family **Lymantriidæ**.

Euproctis lyoma, nov.

♂. Antennæ, palpi, frons, head, body, and fore wings bright ochreous yellow. Fore wings with two broad transverse upright black bands, ante- and postmedial, from the hinder margin towards the costa, which they do not quite reach; these bands are formed of clusters of black atoms, and in some examples are connected together on the hinder margin: hind wings and underside pale yellow, with no markings.

Expanse of wings $\frac{9}{10}$ inch.

4 ♂, Bipindi, Cameroons.

Allied to *E. fasciata*, Walker, but much smaller and quite distinct.

Genus Sapelia, Swinhoe.

Sapelia, Swinhoe, Trans. Ent. Soc. 1903, p. 389.

Sapelia flavipectus.

Sapelia flavipectus, Swinhoe, *l. c.*

1 ♂, Ashanti.

1 ♀, Sapele, River Niger.

The male is better clothed than the female; the frons and pectus are yellow, as in the female, the antennæ are blacker, the head and thorax above are darker, and the legs have the black knee-spots larger.

Expanse of wings $1\frac{7}{10}$ inch.

Types in B. M.

Family **Limacodidæ**.

Scopelodes tantula, nov.

♂. Palpi orange-ochreous beneath, blackish above, with a subapical band of ochreous-grey hairs; antennæ ochreous grey; frons, head, thorax, and wings brown, with a faint purplish tint; abdomen orange-ochreous, with a black dorsal stripe on the anal half. Fore wings with a faint orange streak along the median vein: hind wings broadly orange-ochreous at the base and on the abdominal margin; veins of the hind wings whitish; cilia of both wings orange-ochreous. Underside with the veins of both wings whitish; base of hind wings, the abdominal margin, and cilia of both wings as above; body and legs ochreous, the latter slightly suffused with brown.

Expanse of wings $1\frac{6}{10}$ inch.

Khasia Hills.

Superficially like a very small *Scopulodes venosa*, Walker, but the fore wings are very much narrower in proportion, and the apex consequently acute; the ochreous abdominal margin of hind wings is much more limited, and the legs are ochreous, not black, and the underside altogether very different.

Family **Notodontidæ**.

Hyperæschra collaris, nov.

♂. Palpi and tufts of hair at the base of antennæ dark chocolate-brown, antennæ much paler; frons, head, and collar broadly pure white; body and fore wings dark chocolate-brown in parts, but somewhat variegated with paler shades of colour; a pale space on the costa of fore wings before the apex; a broad pale space from the base nearly to the outer margin just above the hinder margin; some indistinct blackish-brown longitudinal streaks before the outer margin: hind wings dark chocolate brownish grey, without markings: anal tuft of abdomen blackish brown. Underside paler than above, much more uniform in colour.

Expanse of wings $1\frac{9}{10}$ inch.

Khasia Hills. Four examples.

Allied to *H. tenebrosa*, Moore, from Sikkim; the fore wings of a somewhat similar pattern, but easily distinguishable by its prominent white head and collar.

Family Boarmiidæ.

Subfamily *Boarmiinæ.*

Genus Gastrina.

Gastrina, Guen. Phal. i. p. 224 (1857).
Passa, Walker, xxxv. 1563 (1866).

Gastrina serrata.

Xylina serrata, Walker, xi. 761 (1857).
Gastrina denticulata, Swinh. Cat. Het. Mus. Oxon. ii. p. 278, pl. iv. fig. 25 (1900).

Type, Tasmania, in B. M.
Type (*denticulata*), Van Diemen's Land, in Mus. Oxon.
Walker's type being in the Notodontidæ drawer 37 made me overlook it.

Subfamily *Prosolophinæ.*

Genus Diceratucha, nov.

Fore wing elongate, narrow ; costa straight, slightly arched from base and before apex, outer margin obliquely curved, faintly bidentate beyond cell: hind wing broader, outer margin projecting bluntly at middle ; apical angle rounded, anal angle truncated. Antennæ of male ciliated, of female subserrate, pubescent; palpi porrect upwards in front of face, rough-haired, the joints obscured; forehead hairy, with two bluntly conical chitinous projections above ; tongue straight, frenulum present; hind tibiæ rough-haired, with four spurs. Fore wing with the cell three fifths of wing; discocellular vertical, short, both subcostal and median veins being inbent at extremity, first median nervule at quite four fifths, second close before third, lower radial from slightly below middle of discocellulars, upper from upper end of cell, 7 and 8 stalked from the bend close before end; 9 and 10 stalked from two thirds, 9 anastomosing with 7 and 8 ; the areole broad; 11 free : hind wing with the costal and subcostal approximated for nearly the length of the cell, 6 and 7 on a long stalk; discocellular oblique and shortly angled in the middle ; vein 5 present from the outward angulation.

Type, *Diceratucha* (*Œnone*) *xenopis*, Lower, Trans. Roy. Soc. South Australia, 1902, p. 227.

Dr. Turner tells me he is of opinion that this species should

be placed in the Œnochromidæ, on account of the presence of vein 5 in the hind wings, but in every other respect it corresponds to the Boarmiidæ.

Family **Larentiidæ.**

Eulype albifusa, nov.

♂ ♀. Wings black, with a broad curved white band occupying the postmedian fourth of wing, its outer edge bulging in the centre on both wings; fringe black; a deep black cell-spot in the black basal half, across which near the base a faintly paler band is seen; the white band narrower on the hind wings. Underside like the upperside; head and body black, tips of antennæ pale.

Expanse of wings $1\frac{2}{10}$ inch.

Palau Island, Philippines (*Semper*).

The species agrees with *Eulype* in having a single areole in the fore wings, the palpi are longer than usual, the antennæ lamellate, in the male thickened and flattened, subserrate beneath, the teeth short, close and clavate.

XIX.—*On the Sand-Viper of Roumania* (Vipera ammodytes, *var.* Montandoni). By G. A. Boulenger, F.R.S.

When recently discussing the geographical variations of *Vipera ammodytes* *, I pointed out that the Roumanian specimens, two in number, which I had been able to examine agreed neither with the typical form from Austria-Hungary, Dalmatia, Bosnia, and Montenegro, nor with the var. *meridionalis* from Greece and Syria. Having now received five further specimens from Roumania, through my valued correspondent M. A. Montandon, and finding them to agree in essential characters with the two previously noticed, I have no hesitation in regarding them as representing a third form, for which I propose the name var. *Montandoni*.

The following table shows the principal variations in the lepidosis of the seven specimens available:—

* Proc. Zool. Soc. 1903, i. p. 185.

a–c, *e–g*. Greci, on granitic hills in the Macin district, 15 miles from Braila on the Danube.
d. Cocosu Monastery, S.E. of Macin.

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.
a. ♂....	555	70	21	158	38	3	4	5	5	9	9	4	4	11	11
b. „	535	65	„	150	36	3	3½	4½	5	9	9	4–5	4–5	11	10
c. „	470	55	„	152	37	3	3½	4½	7	10	9	5–6	4–5	12	12
d. ♀....	520	60	„	153	32	3	3½	4	6	9	9	4–5	4–5	12	11
e. „	480	50	„	155	31	2	3½	4	5	9	10	4–5	4–5	11	11
f. „	420	40	„	153	30	3	3	4	5	10	9	4–5	4–5	12	11
g. „	195	25	„	149	33	4	2	2½	7	9	9	4–5	4–5	10	10

1. Total length. 2. Length of tail. 3. Number of scales across body. 4. Number of ventral shields. 5. Number of subcaudal shields. 6. Number of whorls of scales on rostral "horn." 7. Width of rostral shield. 8. Depth of rostral shield. 9. Number of scales across vertex between supraoculars. 10, 11. Number of upper labial shields (right and left). 12, 13. Upper labial shields (4th, 5th, or 6th) entering the eye (right and left). 14, 15. Number of scales round the eye, supraocular excluded (right and left).

The var. *Montandoni* may be thus defined:—

Naso-rostral shield not reaching the canthus rostralis nor the summit of the rostral shield, which is deeper than broad; rostral "horn" with 2 to 4, usually 3, transverse series of scales between the rostral shield and the apex. Ventral shields 149 to 158. A more or less distinct dark blotch on the lower lip, involving 5 to 7 labial shields without complete interruption. Lower surface of end of tail yellow.

This race is easily distinguished from the typical form by the shape of the rostral and naso-rostral shields, the extent of the dark blotch on the lower lip, and the yellow colour on the tail (nearly always red in the typical form). From the var. *meridionalis*, to which it is more closely related, the higher number of ventral shields (149–158, instead of 133–147) and the usually lesser development of the rostral "horn" are sufficient characters to justify a varietal separation.

XX.—*On a new Cyprinodontid Fish from Egypt.*

By G. A. Boulenger, F.R.S.

Along with examples of *Paratilapia multicolor*, recently discovered by him, Mr. C. H. Schoeller has kindly sent me several specimens of a little Cyprinodont which occurs near

Alexandria, and of which specimens had previously been obtained by Mr. W. L. S. Loat at Gheit-el-Nasara, Lake Menzaleh. This Cyprinodont belongs to an undescribed species of *Haplochilus*, which I have great pleasure in naming

Haplochilus Schoelleri, sp. n.

D. 7–8. A. 12–13. Sq. 25–28 $\frac{2\frac{1}{2}}{4}$.

Depth of body $3\frac{1}{2}$ to $4\frac{1}{2}$ times in total length, length of head $3\frac{1}{2}$ to 4 times. Eye longer than snout, as long as or a little shorter than postorbital part of head. Origin of dorsal above middle of anal, $1\frac{1}{2}$ to $1\frac{2}{3}$ as far from eye as from root of caudal. Caudal rounded, as long as head. Pale yellowish olive in spirit, the scales finely edged with blackish; fins white, without markings.

Total length 33 millim.

Mr. Schoeller, in the notes with which he has kindly furnished me, states that the whole fish, when alive, shows a splendid dark sky-blue iridescence except on the belly. The dorsal and caudal fins are colourless, but males have the latter edged with red above and beneath; the pectoral, ventral, and anal fins are lemon-yellow, at least during the breeding-season. The iris is colourless.

This *Haplochilus* occurs in great numbers in freshwater wells and watering canals close to Lake Mareotis; it keeps mostly to the surface of the water, always swimming in great excitement, the fins in quivering motion.

Five species are now known from the eastern parts of Africa north of the equator. They may be distinguished by means of the following synopsis:—

I. Dorsal with 6 to 8 rays; scales 24–28 in a longitudinal series.
 A. Anal with 12 or 13 rays; dorsal originating above middle of anal *H. Schoelleri*, Blgr.
 B. Anal with 14 or 15 rays; dorsal originating above posterior third of anal.
 Eye longer than snout, as long as postorbital part of head *H. Loati*, Blgr.
 Eye nearly as long as snout, about $\frac{2}{3}$ postorbital part of head *H. Marni*, Stdr.
 Eye not longer than snout, about $\frac{1}{2}$ postorbital part of head *H. bifasciatus*, Stdr.

II. Dorsal with 11 rays, anal with 14; scales 30 in a longitudinal series *H. Antinorii*, Vincig.

XXI.—*On new Species of* Histeridæ *and Notices of others.* By G. Lewis, F.L.S.

[Plate VI.]

This is the twenty-third paper on the Histeridæ published in this Magazine. In the last (vol. xii. p. 417, 1903), I mentioned the preparation of a new catalogue of the family; but the issue of it is for a short time unavoidably postponed. In the present arrangement of the species I have placed *Niponius* first, because it is the most obvious exponent of those genera whose species have non-retractile heads. In *Niponius* it is a more pronounced character than in *Hololepta*.

List of Species, arranged generically.

Niponius striaticeps, sp. n.
Eutidium lepidum, sp. n.
Hololepta dux, sp. n.
Lioderma intersectum, sp. n.
Plæsius Mouhoti, *Lew.*, 1879.
—— planulus, *Lew.*, 1879.
—— lævis, *Lew.*, 1879.
Placodes Brauni, sp. n.
Platylister soronius, sp. n.
Platysoma ruptistriatum, sp. n.
—— capense, *Wiedm.*
Omalodes mestino, sp. n.
Teinotarsus latipes, sp. n.
Macrolister, gen. nov.
Pachylister, gen. nov.
Hister Belli, sp. n.
—— pachysoma, *Ancey.*
—— Walkeri, sp. n.
Pachylomalus Andrewesi, sp. n.
Pachycrærus cylindricus, *Lew.*, 1879.
Probolosternus termitophilus, sp. n.
Enicosoma, gen. nov.
—— vespertinum, sp. n.
Saprinus dichrous, sp. n.
—— flavopictus, sp. n.
Pachylopus lepidulus, *Br.*

Niponius striaticeps, sp. n. (Pl. VI. fig. 4.)

Cylindricus, parum robustus; fronte transversim striata; elytris pedibusque rufo-brunneis; propygidio 4-foveolato; pygidio 2-foveolato.
L. $4\frac{2}{3}$ mill.

Cylindrical, somewhat robust; head pitchy brown, thorax darker, except at the anterior angles, elytra and abdominal segments reddish brown; the head, armature transversely and distinctly bicarinate, between the eyes there is a fine but clear bowed stria, the surface before the stria is distinctly punctulate, behind the stria the surface is apparently smooth, but a few points can be seen under the microscope; the thorax is distinctly but not densely punctured, and some very fine points are seen between the larger ones; the elytra are striate, the sutural stria is complete or traceable as punctures to the apex and it is joined to the fifth at the base, the other

striæ are evanescent posteriorly and scarcely reach the middle, the interstices are punctulate and there is a shallow impression, somewhat transverse, on either side before the middle; the propygidium has four foveæ similar to those of *N. impressicollis*, Lew. (fig. 1, Proc. Ent. Soc. Lond. p. 335, 1885), and the pygidium has two foveæ resembling those of *N. furcatus*, Lew. (*l. c.* fig. 15); the prosternum is parallel laterally, with marginal striæ which join at the base but are a little shortened in front; the meso- and metasterna have a median canaliculation common to both segments, the latter is marginate laterally; the legs are reddish brown.

In its rather robust form this species most resembles *N. Andrewesi*, Lew.; it is the only species at present known that has a frontal stria.

Hab. Borneo. One example in the British Museum from the Pascoe Collection.

Eutidium lepidum, sp. n.

Ovato-latum, depressum, nigrum, nitidum; fronte plana, obsolete bistriata, striis brevissimis; pronoto impunctato; elytris stria 1ª brevi, cæteris nullis; propygidio fere impunctato; pygidio sparse et minute punctato.

L. 5½ mill. (absque mandibulis).

The wider and more depressed form of this species distinguishes it from the other three known of the genus. Also the absence of any long elytral stria, almost impunctate propygidium, and the sparse and equally scattered fine punctures of the pygidium are characteristic of *E. lepidum*, and there are faint indications of frontal striæ such as are observable in *Hololepta aradiformis*, Er.

Hab. Minas, Brazil (Campos de Diamantina, *E. Gounelle*, 1902).

Hololepta dux, sp. n.

Oblongo-ovata, subparallela, depressa, nigra, nitida; fronte lævissime striata; thorace ♂ foveolato, angulo antice haud producto; elytris stria 1ª appendice recta; propygidio parce circum, pygidio dense, punctato.

L. 15 mill. (absque mandibulis).

Oblong, oval, somewhat parallel laterally, depressed, black and shining; the head is feebly impressed anteriorly with two extremely fine curved frontal striæ, which apparently meet behind the middle of the mentum; the thorax is sparsely punctured at the sides, somewhat acute at the anterior

angles, but not produced, the fovea of ♂ is nearly circular; the elytra, striæ, subhumeral well-marked and shortened before and behind, first dorsal shortened well before the middle with a very short and straight apical appendage; the propygidium is clearly but sparsely punctured at the sides; the pygidium is somewhat narrowed at the angles on either side, punctures generally are close but not coarse, but those at the apex are much finer.

H. dux is similar in size to *H. dilatata*, Sch., but it differs in being more depressed and in outline more oblong; the thorax is not produced at the anterior angles, the apical appendage to the first elytral stria is straight, not crescent-shaped, and the pygidium is narrowed on either side at the base and is less coarsely punctured, with finer points on the apex. I have not seen a female.

Hab. Adamaua, Kamerun.

Lioderma intersectum, sp. n.

Oblongum, subdepressum, nigrum, subnitidum; fronte haud striata; pronoto stria marginali nulla; elytris margine inflexo lævi, striis 1 brevi, 2 valida integra; propygidio circum grosse punctato; pygidio dense et fortiter punctato.

L. 9–11 mill. (absque mandibulis).

This species and *L. cerdo*, Mars., are very similar, but *L. intersectum* differs in the ♂ having the fossettes in the thoracic angles intersected in the middle. In the angles there is a deep bent fossa and behind it a large nearly circular fovea. In *L. cerdo* the fossette is unbroken (see fig. 4, Mon. 1853). Both species are remarkable for the large size of the punctures in the propygidium.

Hab. Marcopata, Peru.

I give here for reference Mr. Blaisdell's notes on two American Histerids in the 'Zoe,' iii. pp. 337, 338 (1892), a publication now discontinued. Both species, although noticed in the 'Zoological Record,' must be considered unpublished until something further is recorded about them.

"*Hololepta pervalida*, sp. n.

"Form strongly [*sic*] oblong, narrower and much less depressed than *yucateca* [*Lioderma*]; sides parallel. Mentum nearly flat, strongly punctate laterally, rather sparsely so at middle; prosternum intermediate [? in width] between the preceding species [*L. grande*, Mars.] and *fossularis*

[*Hololepta fossularis*, Say] ; mandibles rather strongly curved and shorter [? than in *L. yucateca*]."

L. 17½ mill.

Lioderma yucateca, Mars., and *L. grande*, Mars., are the sexes of one species ; *Hololepta fossularis*, Say, has a wide prosternal keel, *Lioderma grande*, Mars., a narrow one.

" *Hololepta neglecta*, sp. n.

" Narrower and more elongate than *vicina* [*Hololepta*, Lec., but a *Lioderma*]. Mentum feebly concave, lines [? dorsal striæ] rudimentary ; prosternum slightly narrowed, subtruncate, sides of prothorax quite evenly arcuate. Side of the body moderately arcuate.

" L. 7 mill.

" This species was identified for me as *H. lucida*, but is entirely different in habitat from specimens subsequently obtained of that species."

Hab. N. America.

Plœsius Mouhoti, Lew. Ent. M. M. xvi. p. 76 (1879).

Ovatus, subconvexus, niger, nitidus ; fronte transversim punctata, stria bisinuata ; pronoto lateribus punctato ; elytris striis 1 integra, 2 basi abbreviata ; propygidio utrinque grosse in medio minor punctato ; prosterno bistriato, lobo grosse punctato.

L. 13–14 mill.

Oval, somewhat convex ; the head, frontal stria bisinuous, with irregular punctures along its posterior edge, in the middle the punctures are formed to represent the acumination seen in *P. pudicus*, Mars. ; the thorax, the marginal stria is complete, the lateral strong and feebly sinuous near the middle and along its border are irregular punctures ; the elytra, striæ, outer humeral nearly complete but broken before the apex, inner apical reaching just beyond the middle, 1 dorsal complete, 2 a little shortened at the base, 3 evanescent ; the propygidium is not very closely punctured and the points are relatively small as compared with the other known species, especially in the median area ; the punctures on the pygidium are larger and more close ; the prosternum, the anterior lobe is coarsely punctured, the keel has two sinuous striæ which are punctured along the inner edges ; the mesosternum is not margined anteriorly ; the hind tibiæ are widely emarginate on the outer edge before the tarsal end. Separated from the other species by the punctuation of the thorax.

Hab. Laos, Siam (*Mouhot*).

Plæsius planulus, Lew. Ent. M. M. xvi. p. 76 (1879).

Oblongus, subconvexus, niger, nitidus; fronte stria fere obsoleta; pronoto stria marginali antice interrupta; elytris striis dorsalibus evanescentibus; prosterno lævi, inter coxas bistriato.
L. 11–13 mill.

Oblong, rather convex, black and shining; the head, frontal stria indicated by a few punctures; the thorax, the marginal stria is interrupted anteriorly after passing the eyes, the lateral stria is not very deep and is parallel to the marginal stria, it terminates behind the anterior angle in a small rugose triangular impression; the elytra, striæ, outer humeral complete, inner apical and short, dorsal are apical and evanescent anteriorly, the first is longest and most distinct; the pygidia are evenly and coarsely punctured; the prosternum, anterior lobe smooth, keel bistriate, striæ parallel to each before the coxæ and sometimes joining in front.

In one example in eight the first dorsal stria is fine and complete.

Hab. Nicobar and Andaman Islands (*Rœpstorff*).

Plæsius lævis, Lew. Ent. M. M. xvi. p. 76 (1879).

Oblongo-ovalis, subconvexus, niger, nitidus; fronte stria interrupta; pronoto stria marginali integra, laterali valide impressa, medio sinuata interstitio paulo lato; elytris striis 1 integra, 2–3 brevibus, punctatis; propygidio in medio subtiliter punctato; prosterno impunctato, bistriato; mesosterno profunde marginato.
L. 11–13 mill.

Oblong-oval, rather convex, black and shining; the head, the labrum is transverse and very narrow, frontal stria biarcuate and well divided in the middle; the thorax, marginal stria complete, lateral deep and sinuous in the middle, and it does not widen out after passing the anterior angle; the elytra, striæ, outer subhumeral complete, inner apical and dimidiate, 1 dorsal fine and complete, 2–3 very short, apical, and more or less distinct; the propygidium is biimpressed, not closely punctured, points smallest and most feeble in the median area; the pygidium is evenly and wholly punctured; the prosternum, anterior lobe with irregular punctures, which occupy only the central area, bistriate between the coxæ; the mesosternum is anteriorly margined with a conspicuously strong and deep stria.

This species and *P. lævigatus*, Mars., are the only species of the genus with a marginate mesosternum. *P. ellipticus*,

pudicus, and *cossyphus*, Mars., and *bisinuatus*, Sch., have no prosternal striæ; in the other known species the prosternum is bistriate.

Hab. Assam and Burma (*Fea*).

Placodes Brauni, sp. n.

Oblongus, opacus, niger, rugoso-punctissimus; fronte concava, stria biarcuata; pronoto stria marginali integra; elytris striis dorsalibus punctatis, leviter impressis, quisque integris; propygidio pygidioque grosse et dense punctatis; prosterno haud striato, inter coxas profunde rugoso-punctato, punctis confluentibus.
L. 14½ mill.

Oblong, opaque, black, and densely punctured above; the head is concave behind the frontal stria, with large irregular punctures, chiefly on the sides of the concavity, the stria is complete and biarcuate; the thorax, the marginal stria is rather fine and continued behind the head, within the marginal stria there is a narrow border free of punctures, but there is no lateral stria visible except behind the anterior angle; the elytra are densely and rather rugosely punctured, the six dorsal striæ are punctate, complete, but not deeply impressed, the outer humeral is impunctate and slightly deeper but much shortened at both ends, the inner humeral is vague, the sutural and fifth striæ apparently join at the base; the propygidium is also densely punctured, but the punctures are large, shallow, and ovate and the surface reticulate between the points; the pygidium is somewhat similarly sculptured, but the punctures are circular; the prosternum, the anterior lobe has a fine but clear marginal stria and a few large irregular punctures; the keel is deeply and very roughly sculptured with deep and confluent punctures, the anterior lobe has but few irregular punctures.

This curious species is somewhat similar to *P. opacus*, Lew.; the latter, however, has no marginal stria in the anterior lobe of the prosternum, which I did not mention in my original description, and in *P. Brauni* the propygidium is more transverse.

Hab. Bothaville, Orange River Colony; taken from the galleries of *Termes tubicola*, Westw., by Dr. H. Braun, after whom I have much pleasure in naming it.

Platylister sororius, sp. n.

Oblongo-ovatus, depressus, niger, nitidus; fronte impressa, stria integra; elytris striis 1–3 validis integris, 4 apicali, 5 et suturali

brevissimis; propygidio transversim punctato; pygidio utrinque impresso, grosse et dense punctato, margine distincte elevato.
L. $5\frac{1}{4}$–$6\frac{1}{2}$ mill.

Oblong-oval, rather depressed, black and shining; the head is microscopically punctured, forehead impressed, with the stria complete; the thorax, lateral stria well marked and continued behind the head; the elytra, striæ, outer humeral fine and complete, inner wanting, oblique stria extremely fine, 1–3 dorsal strong and complete, 4 apical, in length one fourth of the elytron, 5 and sutural shorter, the last sometimes rudimentary; propygidium transversely punctured; pygidium densely and evenly punctured, with the outside margin elevated, especially on each side, where there is a lateral impression; the mesosternum is clearly marginate; the anterior tibiæ are 4-dentate.

Similar to *P. suturalis*, Lew., from Burma, but a little more parallel laterally. *P. atratus*, Er. (common in India), is similar in form, but the pygidium is not marginate, and it is without the short sutural stria.

Hab. Nilgiri Hills (*H. Leslie Andrewes*) and Mahé, Malabar (*Donckier*).

Platysoma ruptistriatum, sp. n.

Oblongum, subcylindricum, nigrum, nitidum; pronoto stria laterali in angulo brevi, post oculos interrupta; elytris striis 1–3 integris, 4–5 abbreviatis, suturali integra ad basi continuata; mesosterno antice haud marginato; tibiis anticis 4-dentatis.
L. 5 mill.

Oblong, parallel at the sides, somewhat cylindrical, black and shining; the head, forehead, and epistoma impressed, surface punctulate, punctures finest anteriorly, stria complete but feeble across the impression; the thorax is nearly quadrate, the lateral marginal stria is hamate anteriorly and terminates at the anterior angle, and at the basal angle it curves inwards; behind the anterior angle is a second short stria (the lateral), hamate outwardly and continued a short space along the anterior margin, behind the head is a straight stria, which is turned backwards at either end behind the eyes (these striæ are almost identical with those of *P. Dufali*, Mars.), the surface is clearly, not closely punctured, with a smooth area behind the disk; the elytra, striæ, outer humeral fine and complete, with an epipleural stria parallel to it, dorsal 1–3 complete, the first and second turning inwards at their bases, 4 dimidiate, 5 shorter, sutural is a little shortened

at the apex, but it continues along the base to a puncture which appears to be an appendage to the fourth stria; the propygidium is biimpressed and, like the pygidium, is clearly not closely punctured; the prosternum, the keel is narrow and smooth, anterior lobe wide and punctulate; the mesosternum is immarginate in front; the tibiæ, anterior 4-dentate, intermediate 3-spinose, tarsal spine bifid, posterior with one conspicuous spine in the middle and a bifid tarsal spine.

Hab. Java. One example in the National Museum from the Bowring Collection.

Platysoma capense, Wiedem., 1821; *Henningi*, Sturm, 1826; *sculptum*, Fåhr., 1851; *punctulatum*, Lew., 1885.

This singularly variable species has also a singular habitat for a *Platysoma*. It is found in the calyx of a species of *Protea* and is very abundant in Cape Colony.

Omalodes mestino, sp. n.

Oblongo-ovatus, convexiusculus, niger, nitidus; fronte distincte punctulata, in medio impressa, stria antice retrorsum acuminata; pronoto subtilissime punctato, stria subvalida; elytris striis 1–2 dorsalibus leviter impressis basi abbreviatis, 3 dimidiata; propygidio pygidioque minime profundis punctatis.

L. 10½ mill.

Oblong-oval and somewhat convex; the head, clypeus, and labrum finely and evenly punctured, frontal stria arched laterally and distinctly acuminately drawn backwards anteriorly, with a shallow impression on the vertex; the thorax is transverse, with an extremely fine punctuation, the marginal stria is fine at sides, more conspicuous at the anterior angle and terminating behind the eyes, the inner stria is well-marked laterally, finer and feebly bisinuous anteriorly, the scutellar puncture is very fine; the elytra, the outer humeral stria is complete, inner wanting, 1–2 dorsal lightly impressed, somewhat punctiform and shortened at the base, 3 very fine, but it touches the base and ceases at the middle; the pygidia have very shallow and somewhat irregular punctures, not closely set; the prosternum, anterior lobe is finely and rather closely punctured, the keel is feebly bistriate; the mesosternum is marginate only at the sides; the anterior tibiæ are 4-dentate, intermediate 6-, posterior 4-, in the last two pairs the processes are longer and more acute.

In outline this species resembles *O. Marseuli*, Sch., but not in sculpture.

Hab. Tumbez, North Peru (*G. A. Baer*, 1900).

Teinotarsus latipes, sp. n.

Ovalis, supra convexus, niger, nitidus; fronte biimpressa, stria integra; pronoto stria marginali integra, laterali nulla; elytris striis 1–3 integris, 4 tenuiter impressa.
L. $5\frac{3}{4}$ mill.

Oval, convex, black and shining; the head, frontal stria complete but not well marked, with two impressions behind it, surface finely punctulate; the thorax, the marginal stria is fine and split into two for the greater part of its length, but behind the anterior angle the two parts unite (this form of stria is seen also in *T. Poggei*, Har.), there is no lateral stria, behind the anterior angle is a well-marked longitudinal depression or shallow excavation, the surface is punctulate very similarly to that of the head, there is a small scutellar fovea; the elytra, striæ fine, outer basal sinuous and dimidiate, inner complete, dorsal 1–3 complete, 2 sinuous and at the base turns away from the first, 4 very fine but complete, and it indistinctly joins the fifth at the apex, 5 reaches the middle, the sutural is shortened one third at the base, surface very finely punctulate, with a few apical acicular markings near the ends of the second to fourth striæ; the pygidia are evenly and more distinctly punctured; the tibiæ are all widely dilated, anterior 3-dentate; the anterior tarsi are longer and more slender than the others; the prosternum is not striate; the mesosternum is feebly sinuous anteriorly and finely marginate.

Hab. Old Calabar. One example in the British Museum from the Murray Collection.

MACROLISTER, gen. nov.

The type of the genus *Hister* is *unicolor*, Linné, and I propose the name of *Macrolister* for a new genus to include species which are obviously different in having a large transverse head, a labrum transverse and emarginate, thorax without any antennal fossettes, and the anterior tibiæ 3-dentate. The type of this new genus will be *H. gigas*, Payk., and the species associated with it are *H. validus*, Er., *latipes*, Beauv., *fortis*, Sch., *robusticeps*, Mars., *tardigradus*, *saginatus*, *robusticollis*, *intrepidus*, *Colensoi*, Lew., *major*, L., *pilicollis*, Sch., *latobius*, *ignavus*, and *maurus*, Mars.

PACHYLISTER, gen. nov.

I propose also to found this genus to include *Hister caffer*, Er. (as the type), *H. inæqualis*, Ol., *nigrita*, Er., *rocca*,

Mars., *conilabris*, Sch., *spinipes*, Mars., *bengalensis*, Wiedem., *reflexilabris*, *ceylanus*, Mars., *lutarius*, *scævola*, Er., *congener*, Sch., and *chinensis*, Quens. In these species the labrum is transverse but projecting anteriorly (in the male very conspicuously so), there are no antennal fossettes, and the anterior tibiæ are 3-dentate. Both in *Macrolister* and *Pachylister* the mesosternum is conspicuously emarginate anteriorly.

Hister Belli, sp. n.

Ovatus, convexiusculus, niger, nitidus; fronte stria antice recta; pronoto stria interna in medio sinuata; elytris striis 1-3 integris, 4–5 brevissimis, punctiformibus; propygidio pygidioque ocelato-punctatis, posticis in mediis lævibus; tibiis anticis valde 3-dentatis.

L. 9½ mill.

Oval, somewhat convex, black and shining; the head, frontal stria complete, straight anteriorly, deepest over the eyes, vertex feebly concave; the thorax, marginal stria fine and terminating behind the eyes, the lateral stria terminates in front after passing the angle, the inner lateral is sinuous in the middle and continues behind the head; the elytra, the inner humeral stria is dimidiate, shortened before and behind (in one example it is very short), the oblique stria is fine but long, dorsal striæ 1–3 complete, 4–5 are represented only by a few apical punctures; the punctuation of the pygidia is very distinctive; both segments are longitudinally finely raised in the middle, the line being clearly visible in certain lights, and the punctuation is large, ocellate, not close but somewhat irregular, and the apices of both segments have a 3-sided area, smooth; the mesosternum is rather deeply emarginate and is bistriate at the sides only; the tibiæ, anterior pair are 3-dentate, apical tooth very strong, intermediate less so, basal short and obtuse, the intermediate and posterior tibiæ are multispinose.

H. lucisus, Lew., *H. Baconi* and *H. assamensis*, Mars., are somewhat similar species to this, but the ocellate punctuation of the pygidia easily distinguishes it.

Hab. Karachi, India (*T. R. D. Bell*).

Hister pachysoma, Ancey, Le Naturaliste, p. 55 (1882).

This species is similar to *H. longicollis*, Mars.; it differs chiefly in having the frontal stria carinate, the thorax with a marginal stria along the sides and three lateral striæ, the elytral striæ are stronger and the fifth and sutural are longer, sometimes even complete, and the mesosternum is anteriorly truncate with a strong marginal stria. The punctuation of

the pygidia is also closer and more coarse than that of *longicollis*.

Hab. Usagara and Kilimanjaro.

Hister Walkeri, sp. n.

Ovalis, convexiusculus, niger, nitidus; stria frontali lati-arcuata; pronoto antice haud sinuato, stria interna integra, externa nulla; elytris, striis 1–4 dorsalibus crenatis validis integris, 5 apicali brevissima, suturali arcuata basi abbreviata; propygidio antice punctato, postice in medio fere lævi; pygidio minus punctato; prosterno ante coxas angustato; mesosterno sinuato valde marginato; tibiis anticis 3-dentatis, posticis spinosis.

L. 5–6 mill.

In its general aspect *H. Walkeri* is somewhat similar to *H. javanicus*, Payk., but it is less convex, the shortened external lateral stria is wanting, the margin is feebly ciliate, and the prosternal keel is narrow like that of *H. corvinus*, Germ. The frontal stria is widely arched, not semicircular, and the only humeral stria is fine and oblique at the base.

This is the only species of *Hister* known from Australia, and I have commemorated this somewhat notable discovery by naming the species after its captor, Mr. J. J. Walker.

Hab. Australia. Three examples taken in a saw-pit at Lilyvale in the Illawarra district, 30 miles south of Sydney, in a part where there is comparatively still much untouched "bush."

Pachylomalus Andrewesi, sp. n.

P. musculo forma similis at major et paulo convexus. Pronoto linea impressa ante scutellum obliqua; propygidio linea basali transversa; prosterno bistriato; mesosterno haud marginato; tibiis dilatatis.

L. $2\frac{2}{3}$ mill.

Oval, convex, black, and shining; the head very finely punctured, frontal stria fine, arched, and complete; the thorax also finely punctured with the ante-scutellar striæ oblique; the elytra are more irregularly but distinctly punctured, especially in the region of the oblique humeral and the first and second dorsal striæ, these striæ are short and very feebly indicated; the prosternum is bistriate and the mesosternum is anteriorly immarginate; the pygidium in the male has an apical impression in which are three smooth bosses placed transversely, the median one being the largest.

This species is rather larger and more oval than *P. musculus*, Mars.; in the latter the pygidium is simply impressed at the apex.

Hab. Nilgiri Hills, India (*H. Leslie Andrewes*).

Pachycræ rus cylindricus, Lew. Ent. M. M. xvi. p. 77 (1879).

Cylindricus, elongatus, cupreo-viridis, nitidus ; fronte impressa, stria transversa nulla ; pronoto stria marginali antice late interrupta ; elytris striis 1–4 et suturali subintegris ; prosterno utrinque parallelo, angustato, bistriato ; mesosterno antice marginato ; tibiis anticis 4–5-dentatis.

L. 3 mill.

Cylindrical, somewhat elongate, coppery green, shining ; antennæ and legs piceous, with the club of the first red ; the head is clearly punctulate, lateral stria continues along the edge of the clypeus, forehead impressed and without a transverse stria ; the thorax is wholly punctulate, points larger than those of the head, lateral stria ceases behind the eyes ; the elytra, striæ, outer humeral complete, inner fine, apical and dimidiate, 1 dorsal shortened apically, 2–4 longer and coequal, 5 obsolete but partly traceable as punctures and at the base there is a larger puncture as an appendage, sutural does not quite reach the apex ; the pygidia are clearly but not closely punctured ; the prosternum, the keel is rather narrow, parallel, and striate laterally ; the mesosternum, the marginal stria is fine and arched behind the acumination, not following the outline of the segment ; the anterior tibiæ are 4–5-dentate.

This species and *P. nigro-cæruleus*, Lew., are the most cylindrical of the genus, of which 45 species are now known.

Hab. Abyssinia (*A. Raffray*).

Probolosternus termitophilus, sp. n.

Oblongo-ovalis, convexus, niger, nitidus, antennis pedibusque piceis ; fronte dense punctulata, stria integra ; pronoto marginato, stria laterali nulla ; elytris striis dorsalibus 1–4 et suturali integris, 5 basi abbreviata ; propygidio dense, pygidio tenuiter punctulato ; prosterno bistriato ; mesosterno marginato ; tibiis dilatatis.

L. 4½–5 mill.

Oval, somewhat oblong, convex, black, and shining ; antennæ and legs piceous ; the head densely punctulate, and the stria, although somewhat feeble anteriorly, is complete ; the thorax has a lateral marginal rim which continues as a fine stria behind the head, the surface is more finely and less densely punctulate than the head, especially behind the neck ; the elytra, there are two fine epipleural striæ and an inner and stronger one all complete, 1–3 also complete and parallel one to the other, 4 and sutural complete and joined as an arch at the base, but the sutural is very fine, 5 is shortened at the base, interstices finely and somewhat sparingly punctulate except at the apex ; the propygidium is punctured similarly to the head ; the pygidium not so distinctly ; the prosternum

is bistriate, striæ parallel to each other before the coxæ; the mesosternum is marginate, and posteriorly the stria joins the transverse stria; the tibiæ are all dilated and the tarsi are coequal in length.

This species is more oblong than the others known. The figure given for *P. permundus*, Lew. Ann. & Mag. Nat. Hist. vi. p. 276 (1900), does not sufficiently show the dilatation of the tibiæ.

Hab. Bothaville, Orange River Colony (*Dr. H. Brauns*). Taken from the galleries made by *Termes tulicola*, Wasm.

Enicosoma, gen. nov.

Corpus oblongum, subquadratum, nigrum, opacum; antennis brevibus, scapo magno, funiculo ei in medio externo adnexo, articulo 1° globoso, 2°–7ᵐ transversis sensim latioribus, clava ovali, articulis connatis; fronte a clypeo haud distincta, antennarum fossa in angulo prothoracis. Pronotum transversum; elytra subquadrata, dorso haud striato. Propygidium inclinatum, basi rectum. Prosternum latum, planum, bistriatum, basi bisinuatum. Mesosternum angustissimum. Pedibus sat longis, tibiis anticis et intermediis extus valde angulatis, posterioribus falciformibus et inermibus.

Enicosoma vespertinum, sp. n. (Pl. VI. fig. 5.)

Oblong, somewhat quadrate, black, and opaque; the head and mandibles vertical in repose, forehead rugose, obscurely carinate laterally and not distinct from the clypeus; the thorax is transverse, truncate anteriorly, with a vertical space on each side of the head (fig. 5 *a*), in the lower part of which space are the antennal fossettes, surface behind the head is opaque and uneven, the anterior edge is carinate, especially at the sides, at the base there is a large and deep transverse excavation, deeply bisinuous in its anterior outline and occupying about half the width of the thoracic base, on the lateral edge there are two robust elevations clothed with reddish-brown hair, the elevations are divided one from the other by a narrow transverse channel; the elytra are feebly granulate and opaque, with a lateral carina which is feebly sinuous, the elytra are shortest at the suture; the propygidium is straight at the base and oblique laterally, with a somewhat small tubercle on either side just before the apex; the pygidium is also straight at the base and semicircular behind; the prosternum, the keel is wide, but it is a little narrowed between the coxæ, flat and smooth with two fine bent striæ, the base is markedly bisinuous; the mesosternum is correspondingly bisinuous, transverse and very narrow and densely punctate with a short sulcus on either side, the

metasternum is also similarly punctured with a slight median depression; the anterior and intermediate tibiæ are strongly angulate on the outer edge, and the first have three tubercles or dentations on the outside edge of the tarsal groove, the posterior tibiæ are falciform.

L. $5\frac{1}{4}$ mill.

Hab. Brazil (Minas). Sertão de Diamantina (*E. Gounelle*, November 1902).

Saprinus dichrous, sp. n.

Ovalis, niger, nitidus, convexiusculus; fronte haud striata; pronoto ciliato, lateribus rugoso-punctatis; elytris macula media transversa flava, striis 4 saturalique arcu basali coëunte; tibiis anticis dilatatis, 8–9-spinosis.

L. $3\frac{1}{2}$ mill.

Oval, black and shining; the head densely punctured and somewhat rugose, without a frontal stria; the thorax is ciliate at the sides and laterally punctate like the head; the elytra have a yellow median band which projects towards the base at the first stria and is divided in the middle by a dark suture, surface rather evenly and closely punctured from the middle to the apical portion, the striæ 1–2 are nearly dimidiate and equal in length, 3 basal oblique and very short, 4 dimidiate and joined to the sutural at the base, sutural complete; the pygidia are densely punctured.

Differs chiefly from *S. crenatipes*, Sol., in the elytral band nearly meeting in the middle, the dorsal punctuation is more spread, and the fourth and sutural striæ are united. The prosternal keel is very narrow before the coxæ, and the striæ diverge at the sides and at an angle before the coxæ join a lateral carina.

Hab. Puerto, S. America.

Saprinus flavopictus, sp. n.

Niger, æneus, nitidus; fronte dense rugoso-punctata; pronoto ciliato, in medio nitido, lævi, lateribus late et densissime rugoso-punctatis; elytris basi rugosis, macula flava, stria suturali integra, striis cæteris obsoletis; pygidio dense punctato.

L. 3–$3\frac{1}{2}$ mill.

Similar to *S. decoratus*, Er., but the head is more densely and more rugosely punctured, the thoracic sculpture is more dense and much more conspicuous, and the dark portion of the elytra is narrow and sutural only behind the middle of the dorsum: in other respects the pattern is similar to that of *decoratus*. The prosternal keel is also

narrower, and the marginal striæ between the coxæ are more sinuous.

Hab. Marcopata, Peru. Many examples.

Pachylopus lepidulus, Br.

This species has been found in some numbers by Mr. J. J. Walker at Wellington, Westport, Sumner, New Brighton, and Timaru in New Zealand. It has similar habits to those of the European *P. maritimus*, Steph., and has one curious character—the club of the antenna is emarginate at the apex.

EXPLANATION OF PLATE VI.

Fig. 1. *Niponius canalicollis*, Lew. (Ann. & Mag. N. H. 1901, viii. p. 370).
Fig. 2. „ *parvulus*, Lew. (Ent. Month. Mag. xxix. p. 184, 1893).
Fig. 3. „ *Andrewesi*, Lew. (*t. c.* p. 183).
Fig. 3 *a* shows the form of prosternal striæ.
Fig. 4. *Niponius striaticeps*, Lew.
Fig. 5. *Enicosoma vespertinum*, Lew.
Fig. 5 *a* shows the facial outline.
Fig. 6. *Orectoscelis humeralis*, Lew. (Ann. & Mag. N. H. 1903, xii. p. 427).
Fig. 7. *Stenotrophis cavifrons*, Lew. (*op. cit.* 1902, x. p. 233).

XXII.—*A Revised Synopsis of the Tsetse-Flies* (*Genus* Glossina, *Wied.*), *with Notes on* Glossina tachinoides, *Westwood.* By Ernest E. Austen.

In the writer's Monograph *, published last year, seven species of the genus *Glossina* were recognized and described. As was only to be expected, the increased attention paid to the tsetse-flies of late, due in great measure to the identification by Colonel David Bruce of one of the species (*Glossina palpalis*, Rob.-Desv.) as the active agent in the dissemination of the dread disease of Tropical Africa known as Sleeping-Sickness, has led to the collecting of these insects in greater numbers. The result is that it is now possible to form a somewhat clearer view of the different species and their characteristics than was feasible at the time that the Monograph was written, when the amount and condition of the material available for examination left much to be desired. The conclusions now arrived at are embodied in the amended synopsis of species printed below.

* 'A Monograph of the Tsetse-Flies [Genus *Glossina*, Wiedemann]: based on the Collection in the British Museum.' By Ernest Edward Austen. London: Printed by Order of the Trustees. 1903.

Synopsis of Species of the Genus Glossina.

1. Hind tarsi entirely dark, or at least all the joints more or less dark (in the ♀ of *Gl. tachinoides* the basal half of the first joint and the extreme bases of the two following joints are usually pale) 2.
 Hind tarsi not entirely dark; last two joints alone dark, remainder pale 4.
2. Ground-colour of abdomen ochraceous buff, with interrupted dark brown transverse bands, and sharply defined pale hind borders to the segments; a very conspicuous square or oblong pale area in the centre of the second segment: small species, not exceeding 8 mm. in length (exclusive of proboscis), ♂ considerably smaller *tachinoides*, Westw.
 Abdomen not so marked, very dark, hind borders of segments if lighter extremely narrow and cinereous; pale area in centre of second segment usually triangular, with apex directed backwards and continued into a cinereous median stripe: larger species 3.
3. Third joint of antennæ dusky brown to cinereous black *palpalis*, Rob.-Desv.
 Third joint of antennæ pale (orange-buff) *pallicera*, Bigot.
4. Large species: length at least 11 mm. ($5\frac{1}{4}$ lin.), wing-expanse (measured from tip to tip, when wings are set at right angles to body) at least 25 mm. ($11\frac{3}{4}$ lin.) 7.
 Smaller species: length rarely reaching 11 mm. ($5\frac{1}{4}$ lin.), often considerably less; wing-expanse not exceeding 25 mm. ($11\frac{3}{4}$ lin.) .. 5.
5. Last two joints of front and middle tarsi with sharply defined dark brown or black tips .. 6.
 Last two joints of front and middle tarsi without sharply defined dark brown or black tips; front and middle tarsi entirely yellow, or last two joints of former faintly tipped with pale brown *pallidipes*, Austen.
6. Generally distinctly larger; head wider; front darker and narrower in both sexes, sides parallel in ♂; abdominal bands deeper, leaving hind margins of segments only narrowly pale; hypopygium in ♂ smaller, darker, and more hairy; tip of ♂ abdomen more thickly clothed laterally with short black hair, bristles on sixth segment finer and less prominent *longipalpis*, Wied.
 Usually smaller; head narrower; front paler and wider; eyes in ♂ as well as in ♀ distinctly converging towards vertex; abdominal bands less deep, pale hind margins of segments therefore deeper; hypopygium in ♂ larger, paler, somewhat more oval in outline, and clothed with fewer fine hairs; tip

of ♂ abdomen less hairy laterally; bristles on sixth segment in ♂ stouter and more conspicuous *morsitans*, Westw.

7. Dorsum of thorax with four sharply defined small dark brown oval spots, arranged in a parallelogram, two in front of and two behind transverse suture; bulb at base of proboscis brown at the tip *longipennis*, Corti.

Dorsum of thorax without such spots, though with more or less distinct longitudinal stripes; bulb at base of proboscis not brown at the tip *fusca*, Walk.

In the Monograph already referred to, *Glossina tachinoides*, Westwood, was regarded by the writer as a variety of *Gl. palpalis*, Rob.-Desv.* Within the last few days, however, the British Museum has received from Mr. W. F. Gowers a series of fifty tsetse-flies from the Benue River, Northern Nigeria, where they were collected by the donor during a journey down the river in a canoe in the latter half of May and beginning of June of the present year. In general appearance these specimens closely resemble small individuals of *Gl. morsitans*, but may be at once distinguished from this species by their dark hind tarsi. On comparison with the type of *Gl. tachinoides*, Westw.†, now in the collection of the Hope Museum, Oxford, not only were Mr. Gowers's specimens found to be specifically identical with it, but the examination of this fine series showed that *Gl. tachinoides* must be restored to specific rank, as a near ally of *Gl. morsitans*, Westw. Except as regards the colour of the hind tarsi, *Gl. tachinoides*, which is the smallest of all the tsetse-flies, is not closely related to *Gl. palpalis*. The forms previously regarded by the writer as constituting a variety of *Gl. palpalis*, Rob.-Desv., and designated by him var. *tachinoides*, Westw., must now be considered a variety of *palpalis*, which may for the present remain unnamed. The British Museum also possesses two other specimens—one from Old Calabar, May 14, 1900 (*Dr. Annett*), the other from Benin (*A. Millson*)—which appear to represent a second variety of *Gl. palpalis*. In the colour of the abdomen, at any rate, this second variety presents a certain approximation to *Gl. pallicera*, Bigot.

Quite recently *Gl. tachinoides*, Westw., has been redescribed by Dr. E. Brumpt, of the Laboratoire de Parasitologie, Paris, under the name *Glossina Decorsei*. An examination of

* *Cf. op. cit.* p. 74.

† This type is a mere fragment, but fortunately sufficient remains for purposes of identification.

specimens kindly submitted to the writer by Dr. Brumpt himself and also by Prof. Mesnil, of the Institut Pasteur, leaves no doubt of their identity. The synonymy of *Gl. tachinoides* is therefore as follows:—

Glossina tachinoides, Westw.

Glossina tachinoides, Westwood, Proc. Zool. Soc. Lond. pt. xviii. p. 267, pl. xix. fig. 2 (1850); Ann. & Mag. Nat. Hist. ser. 2, vol. x. p. 147 (1852).

Glossina Decorsei, Brumpt, Comptes rendus des séances de la Société de Biologie (Séance du 16 avril, 1904), t. lvi. p. 628.

Dr. Brumpt's specimens were obtained not long ago by Dr. Decorse in the basin of the River Shari and on the shores of Lake Chad, into which the river falls. Seven of the series collected by Dr. Decorse have been presented to the British Museum by Prof. Mesnil and Dr. Brumpt; the National Collection has also received a single specimen of *Gl. tachinoides* from the neighbourhood of Wushishi, Kadima River Valley, N. Nigeria, where it was obtained in the beginning of March, 1904, by Dr. S. H. Jones.

The following interesting field-notes have been kindly supplied to the writer by Mr. Gowers:—"*Glossina tachinoides* is found along the course of the Benue River between Lau and Lokoja. No horses or cattle can be kept in this area, except in one or two small spots. Above Lau, however, the river-banks are swarming with cattle, and there are large encampments of herdsmen in the dry season. After the rains have commenced the fly is present on the river in sufficient numbers to be an annoyance to travellers, and it continually bites the canoe-men. In the dry season, however, which lasts from October to April, it is much less numerous.

"The game found on the Benue River in the area in question, and on which the fly probably feeds, consists chiefly of *Kobus kob*. On the banks of the river this is almost the only species, and it is very numerous indeed. West-African buffalo, waterbuck, and reedbuck are found in the swamps near the river; but in the Benue Valley there are, in the immediate vicinity of the river, more kob than specimens of all the other species of game put together."

According to Brumpt (*loc. cit.* p. 629), in the basin of the Shari River and on the shores of Lake Chad *Gl. tachinoides* appears to be confined to the water's edge.

From Mr. Gowers's statements there can be little doubt that *Gl. tachinoides*, like *Gl. morsitans*, *pallidipes*, and *longipennis*, and possibly other species as well, is capable of

carrying *Trypanosoma Brucei*, the hæmatozoon causing the fatal malady among domestic animals known as tsetse-fly disease or Nagana. Brumpt is inclined to think that Sleeping-Sickness may also be transmitted by several species of tsetse-flies, and the mere possibility that this may ultimately prove to be the case lends peculiar importance to the bionomics of these interesting Diptera.

XXIII.—*Description of a new Fish of the Genus* Alestes *from Natal.* By G. A. Boulenger, F.R.S.

Alestes natalensis.

Depth of body equal to length of head, $3\frac{3}{4}$ times in total length. Head twice as long as broad, once and $\frac{1}{4}$ as long as deep; snout rounded, not projecting beyond lower jaw, $\frac{2}{3}$ diameter of eye, which is 3 times in length of head; adipose eyelid feebly developed; interorbital width $\frac{1}{3}$ length of head; maxillary not reaching to below anterior border of eye; 16 teeth $(\frac{8}{8})$ in the upper jaw; lower border of second suborbital as long as eye. Gill-rakers long and slender, 21 or 22 on lower part of anterior arch. Dorsal II 8, above ventrals, equally distant from centre of eye and from root of caudal; first branched ray nearly as long as head. Adipose fin small, twice and a half as far from rayed dorsal as from caudal. Anal III 19, longest ray nearly half length of head. Pectoral $\frac{3}{4}$ length of head, not reaching base of ventral. Caudal deeply forked. Caudal peduncle once and a half as long as deep. Scales $33\ \frac{5\frac{1}{2}}{3\frac{1}{2}}$, 2 between lateral line and root of ventral. A blackish lateral stripe, extending to the median rays of the caudal fin.

Total length 85 millim.

Two specimens from near Durban, received from Mr. F. W. Quekett.

Nearest ally *A. lateralis*, Blgr., from Lake Dilolo, Katanga, with which species it may ultimately have to be united. No *Alestes* has hitherto been recorded from south of the Zambesi.

XXIV.—*On some small Mammals collected by Mr. A. M. Mackilligin in the Eastern Desert of Egypt.* By Oldfield Thomas.

Mr. Arthur M. Mackilligin has recently collected some small mammals in the eastern desert of Egypt, near the Soudan frontier, about lat. 22° and long. 35°, and these prove

to be of much interest; for even with the magnificent accession to our knowledge of the mammals of Egypt represented by the late Dr. Anderson's work on the subject, this eastern desert has by no means been worked out, and Mr. Mackilligin has now discovered two new species, a bat and a gerbille, while an examination of his specimens of another bat, already obtained by Dr. Anderson, show this also to need a special name.

Besides the species described in detail below Mr. Mackilligin obtained in the same district examples of *Asellia tridens*, *Gerbillus gerbillus*, *Acomys* sp., and *Jaculus jaculus*.

Rhinolophus Andersoni, sp. n.

Rhinolophus Antinorii, Anderson and de Winton, Mamm. Egypt, p. 96, pl. xvi. fig. 2 (1902) (nec Dobs.).

Allied to *R. clivosus*, Rüpp., but with no small anterior premolars and different colour.

General characters as in *R. clivosus*, the nose-leaf and ears being apparently very much as in that species *; perhaps the front face of the median vertical process is slightly more narrowed upwards, but the difference is very slight; horseshoe small, not covering the muzzle laterally. Wings from the ankles.

Colour drab-grey, the hairs above *slightly* darkened terminally, those of the belly drab-grey throughout. In *R. clivosus* the belly is white. Membranes transparent greyish, rather darker along the centres of the digital interspaces.

Skull with a broader heavier muzzle and nasal region than in *R. Dobsoni* (the bat considered by Dobson as *R. clivosus* †) or than in *R. euryale*.

Small premolars, both upper and lower, absent in every specimen, the large upper premolar pressed close against, even overlapping, the canine. In *R. clivosus* the small premolars are present both above and below.

* Figure of the type given by Peters, Von der Decken's Reise, Säug. pl. ii. (1869).

† *Rhinolophus Dobsoni*, sp. n.

Rhinolophus clivosus, Dobs. Cat. p. 120 (nec Rüppell).

Type. Specimen *b*. ♀. B.M. no. 47. 5. 7. 49. (Forearm 44 mm.)

Hab. Kordofan.

As Peters has shown, the true *R. clivosus* of Rüppell, from Mohila, Arabia, is one of the group with the large upper premolar pressed close against the canine, the small premolar being in the outer angle. In Dobson's bat, on the other hand, although he puts it in the same group, the anterior premolar separates the second premolar from the canine. This difference cannot be due, as he supposed, to immaturity, one of the specimens at least being fully adult.

Dimensions of the type (measured in the flesh) :—

Forearm 46 mm.

Head and body 53; tail 28; ear 22.

Skull: front of canine to occiput 19; length in middle line 16; front of bony palate to basion 12 5; breadth of palate across m^2 7·5; tip of upper canine to tip of large premolar 1·6; front of lower canine to back of m_3 8·3.

Type. Male. Original number 26. Captured 3rd August, 1903. Four specimens.

"Arabic name 'Wat-wat'; Bisharin name 'Humush-Kilite.'"—*A. M. M.*

In the British Museum collection there is already a spirit-specimen of this bat, obtained by Dr. J. Anderson at Gizeh. This is the *R. Antinorii* of that naturalist's 'Mammals of Egypt,' a note being appended by Mr. de Winton drawing attention to its possible identity with *R. clivosus*. It is certainly not *R. Antinorii*, which is larger in all ways and has especially a much larger nose-leaf, the horseshoe of which nearly covers the muzzle.

With *R. clivosus* it has no doubt a nearer affinity, but seems to differ sufficiently by its different colour and the constant absence of the minute premolars to be recognized as a distinct species. I have also ventured to distinguish the Kordofan bat described by Dobson under the name of *R. clivosus*, as it has the small premolars quite separating the canines from the large premolars.

Whether the queer greenish colour of the two specimens of *R. Dobsoni* ("sulphur-brown above, beneath canary-colour," Dobson) is natural or the result of defective preservation can only be determined when further examples are obtained.

Pipistrellus ariel, sp. n.

A pigmy species of a very pale colour.

Size very small, not exceeding that of *P. nanus*; form slender, limb-bones unusually light and delicate. Fur long, but not dense; hairs of back rather over 7 mm. in length. General colour above pale buffy, the slaty bases of the hairs showing through; below similar, but slightly paler. Membranes pale brown, without lighter edging; naked throughout, except quite close to the body. Ears rather short; inner margin strongly convex below, with very small basal lobule, slightly convex above; tip rounded off; outer margin convex, slightly above, strongly below, with a long, low, rounded antitragal lobe. Tragus rather short, broadest rather above its inner base, inner margin straight, tip rounded, outer margin evenly convex; basal lobule distinct, rounded.

Wings to the base of the toes. Post-calcareal lobule very narrow. Tip of tail little projecting.

Skull, as compared with that of *P. nanus*, similar in size, but with a broader, flatter muzzle and smaller brain-case. Median palatal spine less developed. Base of skull between bullæ conspicuously narrower.

Incisors slender, conical, unicuspid terminally, though each has a minute basal cusplet on its cingulum behind; the outer two thirds the height of the inner. Small upper premolar unusually minute, hidden in the inner angle between the closely adpressed canine and large premolar, and lower than their cingula, so as to be quite invisible from without. Lower incisors trifid, overlapping, subequal in horizontal length, but the outer pair slightly thicker than the others. Anterior lower premolar two thirds the height of the second, small in section, the canine and large premolar almost touching each other on its inner side.

Dimensions of the type (the measurements in inverted commas taken by the collector in the flesh) :—

Forearm 30 mm.

"Head and body 34"; "tail 34"; "hind foot 5"; "ear 10"; tragus on inner edge 3·1; third finger, metacarpus 27, first phalanx 9·3, second phalanx 10; fifth finger 36; tibia 12·5.

Skull: greatest length 11·3; basal length in middle line 8·4; breadth of brain-case 5·5; front of canine to back of m^3 3·7; least breadth of basioccipital between bullæ 0·6

Hab. Eastern Egyptian desert, lat. 22° N., long. 35° E. Alt. 2000 feet.

Type. Adult female. Original number 28. Collected 12th August, 1903. Two specimens.

This most interesting little bat is widely different from any species yet described, the proportions of its upper incisors distinguishing it at once from most members of the genus. Its anterior upper premolars are so minute that they would probably be overlooked by any worker only examining spirit-specimens; but there is no recorded "*Vespertilio*" of so small a size in Egypt.

Dipodillus Mackilligini, sp. n.

A pencil-tailed species similar to *D. famulus*, Thos., but smaller.

Size small. Fur of medium length, hairs of back about 9–10 mm. long. General colour above pale fawn, finely washed with black, the dorsal hairs each with a fawn subterminal ring and a black tip; sides of a warmer fawn,

without black intermixture; under surface pure white, the line of demarcation not very sharply defined. Supraorbital and postocular white spots present, but not particularly conspicuous; ears decidedly shorter than in *D. famulus*. Outer side of arms and legs like body, inner white; upper surface of hands and feet white; palms and soles wholly naked; pads of sole six, as usual, but the hallucal one jammed close up to the three terminal pads, the hallux itself being apparently set on rather more distally than usual. Tail long, its hairs gradually lengthening terminally into a conspicuous blackish pencil, the hairs of which may attain to 13 mm. in length; brown above, darkening on the pencil to black, dull fawn below proximally, the terminal half dark all round.

Skull conspicuously smaller than that of *D. famulus*, the bullæ also smaller in proportion and less elongated anteriorly. Teeth with the characteristic *Dipodillus* pattern, the middle inner lobe of m^1 half anterior to the outer lobe.

Dimensions of the type (measured in the flesh) :—

Head and body 78 mm.; tail 138; hind foot 24; ear 14.

Skull: greatest length 27; basilar length 19·6; nasals, length 10; interorbital breadth 4·8; breadth of brain-case 12·6; diastema 7; length of bulla 10; length of upper molar series 3·6.

Hab. Wady Alagi, Eastern Egyptian desert, lat 22° N., long. 35° E. Alt. 2000 feet.

Type. Adult female. Original number 35. Collected 9th October, 1903. Four specimens.

This very pretty pencil-tailed gerbille is quite unlike anything hitherto described from Egypt, its nearest ally appearing to be the much larger *D. famulus* of Aden.

XXV.—*On a new Species of* Amastra *from the Hawaiian Islands.* By E. R. Sykes, B.A.

Amastra (*Kauaia*) *rex*, sp. n.

Shell much depressed, heliciform; umbilicus deep, of moderate size; dark horn-colour, strongly rugosely striated, with a fairly large protoconch; whorls five, increasing regularly, plano-convex, the suture being impressed and well marked; the last whorl is carinate, flattened above and somewhat inflated at the base; at the periphery the periostracum is exaggerated into a produced layer, from which

projections in the shape of arrow-heads arise at right angles to the periphery; mouth subquadrate, with the lip hardly thickened and not reflected; columellar plait fairly strong and horizontal.



Amastra (*Kauaia*) *rex*.

Diam. maj. (with the peripheral wing) 14·5, alt. 4 mm.

Hab. Summit of Konahuanui, Oahu, Hawaiian Islands, amongst dead leaves and moss.

This very interesting shell was collected by Mr. Ernest Lyman, and was kindly sent to me by Prof. H. W. Henshaw.

It somewhat recalls in form and appearance the well-known *Helicina agglutinans*, the periostracum covering the shell and being produced into an uneven wing at the periphery, some of the projections extending to 2 mm. from the shell. The species belongs to the group of *Amastra alata*, Pfr., and *A. heliciformis*, Ancey; from the latter, which is also an Oahu shell, it may readily be separated, in addition to its greater size and remarkable development of periostracum, by its more depressed form and smaller (proportionally) umbilical area.

BIBLIOGRAPHICAL NOTICES.

Index Faunæ Novæ Zealandiæ. Edited by Capt. F. W. Hutton, F.R.S. Published for the Philosophical Institute of Canterbury, New Zealand. London: Dulau, 1904. Pp. viii, 372.

This is an extremely useful publication, and it is a great advantage to have such an Index to the natural productions of an area which is sufficiently limited to admit of its being given in a moderate compass. Captain Hutton's name is well known to all students of New Zealand natural history, and it is very creditable to the colony that nearly all the other contributors to the volume are resident in New Zealand.

In the Introduction the Editor deals, as fully as space will permit, with previous work, from the voyages of Captain Cook (1764–1774), accompanied by Sir Joseph Banks, and other well-known naturalists and artists, to the present time. He also discusses the elements of the New Zealand fauna and the supposed existence of the Antarctic continent, and comes to the conclusion that the New Zealand fauna and flora cannot be considered to be truly oceanic, though they must have been separated from any continent for a very long period. A short Bibliography, restricted apparently to books and papers relative to the general characteristics of the country and its fauna and flora, is also added.

The lists of species are well classified and arranged, and are available for immediate reference, even apart from the complete Index of Genera at the end of the book. We have noticed a few misprints, some of the earlier ones being corrected in a list; but they are generally not of a very serious character—"Hawthorn" for "Haworth" (p. 350) and "*Leucanium*" for "*Lecanium*" (p. 353) are the most important which we have noticed; the latter name is spelt correctly on p. 227.

There is an Appendix of naturalized animals, to which we must object that several apparently indigenous species have been included by incorrect identification. Thus, to quote two instances: on p. 349, *Monostegia antipoda*, Kirb. (a saw-fly), is wrongly given as a synonym of the European *Eriocampa adumbrata*, Klug, though it does not belong to the same genus; and on p. 353 a *Mantis* (*Orthodera ministralis*, Fabr.) is noted as introduced from Australia. In fact, closely allied but distinct species or subspecies of *Orthodera* are found in Australia, Tasmania, and New Zealand respectively, and the last was described as *Mantis novæ-zealandiæ* by Colenso, and must retain that name. We suspect that other forms supposed to have been introduced into New Zealand from Australia will also prove, when sufficiently known, to be representative forms, and not introductions.

A Manual of Palæarctic Birds. By H. E Dresser, F.L.S., F.Z.S., &c. Part II. Published by the Author at 3 Hanover Square, W.

Some time since, it will be remembered, Part I. of this work was reviewed in these pages. Therein we pointed out certain features that seemed to call for criticism. These objections apply also to this second part. The author, however, cannot be blamed for this' for even had he felt inclined to concede to the views then expressed' he could scarcely do so unless a second edition is called for, and this is a by no means remote contingency.

Without question, this is a work that should find a place on the shelves of every ornithologist. Condensed as the descriptions of the species naturally are, yet a great deal of useful and valuable information concerning habits or other peculiarities of the birds of the

Palæarctic Region will be found in these pages. The fact that the eggs of the Osprey taken from the nests of American birds may be distinguished by their "strong musky smell" is a case in point. But it seems hardly necessary to tell us that Ducks and Pelicans swim well! Yet Mr. Dresser gravely assures us that this is a fact!

MISCELLANEOUS.

On the Ossiferous Cave-deposits of Cyprus.

By Dorothy M. A. Bate.

Previous to 1901 no systematic search of the cave-deposits of Cyprus appears to have been attempted. The geology was studied by M. Albert Gaudry, who published an elaborate work in 1862 with a geological map, and Drs. Unger and Kotschy in 1865 also gave a geological map of the island, differing somewhat from their predecessor.

As long ago as 1700 the Dutch traveller Corneille le Brun (Van Bruyn) published an account of his wanderings in Cyprus and the Levant, and mentions having visited a bed of bones, supposed to be those of saints, not far from the Monastery of Haghios Chrysostomos. A drawing of one of these bones is given, which Dr. Forsyth Major has since shown to be that of *Hippopotamus minutus* *.

The author started in 1901, in expectation of discovering an extinct fauna in this ossiferous breccia, and this expectation was amply fulfilled, for no fewer than twelve ossiferous caves were found—five at Cape Pyla in the south-east, and seven on the southern slopes of the Kerynia Hills in the north of the island.

Two caves (mentioned by General di Cesnola in 1877, at Cape Pyla, as containing *human* fossilized bones) were first visited by the author. The rock is here composed of Miocene (probably Helvetian) limestone, weathered to a very great extent, and full of marine shells and corals, as well as numerous Echinoids (*Clypeaster portentosus*), also met with in the Miocene limestones of Malta.

Here a number of caves were discovered in the cliffs, five of which yielded remains of *Hippopotamus minutus*.

The author then describes these caves in detail. The caves explored at Cape Pyla were:—(1) The Red Cliff Cave; (2) the Great Anonymous Cave; (3) the Small Anonymous Cave; (4) Haghios Jannos; (5) Haghios Saronda. This is the cave to which formerly pilgrimages were made and candles burned in honour of the sacred remains of saints.

The cave-deposits of the Kerynia Hills are of uncertain geological age, no fossils having been obtained from the limestone-rock of

* Proc. Zool. Soc., June 1902.

which they are chiefly composed. Professor Gaudry concludes that the rock is of Cretaceous age, and therefore the oldest sedimentary deposit in the island. The seven caves discovered were all on the southern side of the range, between the Aghirdhir Pass and the village of Kythræa, in a low broken line of cliffs parallel with the main ridge. These are called the Kerynia caves and are named :— (1) Coutzaventis ; (2) Haghios Chrysostomos ; (3) Anoyero Spelios ; (4) Dikomo Mandra ; (5) Haghios Elias ; (6) the Elephant Deposit ; (7) the Western Cave.

Most of these caves have, by reason of long atmospheric erosion, partially or wholly disappeared, leaving the stalagmitic flooring containing mammalian remains unprotected and exposed often at a considerable distance from the face of the cliffs. But although many of them are now almost obliterated by the falling in of the roof and walls, the author points out that wherever this has happened the limits of the floor are sharply defined by the hard ossiferous deposit and the stalagmitic floor. In close proximity are caves still preserved containing precisely similar deposits.

The fauna of the caves is comparatively scanty, the only other important extinct form besides the dwarf elephant and hippopotamus being a new species of genet (*Genetta plesictoides*), described in the 'Proceedings of the Zoological Society.'—*From the Proceedings of the Royal Society*, June 9, 1904. (Communicated by the Author.)

Further Note on the Remains of Elephas cypriotes, *Bate, from a Cave-deposit in Cyprus.* By Dorothy M. A. Bate.

This paper is a continuation of one *already published* * "On the Discovery of a Pigmy Elephant in the Pleistocene of Cyprus," and enters into a detailed description of the teeth of this small proboscidean whose remains are now in the British Museum of Natural History.

The collection includes incisors, milk-molars, and permanent molars. Several of the latter still retain their position in the jaws, and, in some instances, the teeth of both sides of the same individual were found.

The permanent incisor tusks of two forms, presumably belonging to males and females, were found. They differ from the same teeth of the Maltese dwarf elephants in being considerably compressed laterally. The largest specimen measures 29·7 cm. along the outside of the curve, with a maximum diameter of 3·7 cm.

Of the upper cheek-teeth the third and fourth of the milk-series as well as the three permanent molars are described in detail. There was a small third milk-molar (2 mm.) implanted by a single root, but no specimen was collected.

* Read before the Royal Society, May 7, 1903.

Of the lower series the third and fourth milk-molars and the three permanent teeth were represented by numerous examples and are fully described.

An almost entire left ramus of one young individual and the symphysial portion of another are also described. The only limb-bone obtained was the distal portion of a femur.

A corrected ridge-formula for the molars of *E. cypriotes* is furnished, which, exclusive of talons, will stand as follows:—

$$\div, \frac{5}{5'} \frac{7—8}{7—8'} \frac{7—8}{7—8'} \frac{8—9}{8—9'} \frac{11—12}{11—12'}$$

Dr. Leith Adams gives *E. melitensis* as follows:—

$$\frac{3}{3'} \frac{5}{5'} \frac{8—9}{8—9'} \frac{8—9}{8—9'} \frac{10}{10'} \frac{12}{12'}$$

There appears to be a strong resemblance between the teeth of *E. cypriotes* and those of the Maltese and Sicilian pigmy forms, more especially *E. melitensis*, but the marked lateral compression of the tusks in *E. cypriotes*, which is a constant character in all the specimens so far obtained, would in itself be almost sufficient to distinguish this species from the other pigmy elephants of the Mediterranean region. There seems to be good evidence that *E. cypriotes* was isolated and subsequently differentiated at an earlier period than the other small Mediterranean species in Malta and Sicily, the zoological evidence giving considerable support to the belief that Cyprus became an island at an earlier period, an idea which is further strengthened by the fact that the whole island is surrounded by deep water and is not connected with the neighbouring lands by submerged banks, as is the case with the Maltese islands.

The Maltese pigmy species have been considered most closely allied to *E. antiquus* and *E. africanus*. On the other hand, it seems probable that *E. cypriotes*, which shows no affinity to the African species, is rather connected with *E. antiquus* and *E. meridionalis*.

It may be remarked that the remains of *E. cypriotes* and of *Hippopotamus minutus*, with which it is associated, vary but little in size, whereas in the dwarf species of elephants and hippopotami from Malta and Sicily a considerable variation in size is observable, so much so, indeed, that molars may be seen intermediate in size connecting *H. melitensis* (=*minutus*), *H. pentlandi*, and *H. amphibius*. —*From the Proceedings of the Royal Society*, June 9, 1904. (Communicated by the Author.)

THE ANNALS

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[SEVENTH SERIES.]

No. 81. SEPTEMBER 1904.

XXVI.—*The Lepidoptera-Phalænæ of the Bahamas.*

By Sir George F. Hampson, Bart., B.A., F.Z.S., &c.

The following list of moths from the Bahamas is supplementary to that published in the 'Annals' (7) vii. p. 246 (1901).

Syntomidæ.

Syntomeida syntomoides, Boisd. Spéc. Gén. Lép. i. pl. xvi. fig. 4 (1836).

Nassau (*Sir G. Carter*) ; Andros (*Neville Chamberlain*).

Lymire Edwardsi, Grote, Pap. i. p. 4 (1881).

Abaco (*P. A. Meers*) ; Nassau (*Sir G. Carter*).

The Nassau specimens are like those from Florida ; the males from Abaco have the fore wing whiter, the hind wing without brown on the veins and termen ; the female of both forms has the hind wing wholly suffused with brown.

Arctiadæ.

Lithosianæ.

Mulona nigripuncta, Hmpsn. Cat. Lep. Phal. B. M. ii. p. 387, pl. xxix. fig. 6 (1900).

Abaco (*P. A. Meers*) ; Andros (*Bonhote*).

Arctianæ.

Ammalo insulata, Wlk. iii. 734 (1855) ; Hmpsn. Cat. Lep. Phal. B. M. iii. p. 84, pl. xxxvii. fig. 14.

Andros (*Bonhote*).

Halisidota cinctipes, Grote, Proc. Ent. Soc. Philad. v. p. 242 (1865).

Nassau (*Sir G. Carter*).

Halisidota albipennis, sp. n.

♀. Head and thorax white; tegulæ and patagia with indistinct fuscous annuli ; palpi with fuscous marks at sides ; legs with slight fuscous bands, the fore femora yellow above ; abdomen white, dorsally yellow except at extremity. Fore wing white, with numerous waved interrupted fuscous lines, forming obscure annuli ; an antemedial semicircular mark on costa ; a discoidal lunule, with ill-defined oblique band formed by the waved lines from it to inner margin. Hind wing pure white.

Hab. Nassau (*Sir G. Carter*), 2 ♀ type. *Exp.* 50-54 mm.

Apantesis bicolor, sp. n.

♂. Head and thorax black ; abdomen scarlet, with dorsal series of large, partly conjoined, quadrate black spots, a lateral series of somewhat triangular spots, the extremity and ventral surface black. Fore wing uniform black. Hind wing scarlet ; the costal area and termen towards apex black ; a subterminal black point below vein 2. Underside with short scarlet streaks on base of costa of both wings, the retinaculum scarlet.

Another specimen has three subterminal black spots on hind wing ; a third has the costal half of hind wing black ; and a fourth has a crimson ring on neck, fore wing with pale crimson fascia on costa to beyond middle, a small white spot at lower angle of cell, the cilia pale, hind wing with the costal half pale.

Hab. Abaco (*P. A. Meers*), 4 ♂ type. *Exp.* 44 mm.

Agaristidæ.

Tuerta hemicycla, sp. n.

♂. Head and thorax clothed with brown-red and white hair ; tarsi ringed with white ; abdomen fulvous, dorsally tinged with red, whitish at base. Fore wing pale olive,

thickly irrorated with brown-red; a subbasal red band from costa to submedian fold; orbicular and reniform defined by red, with red centres, and with patches of silvery scales on them, a semicircular white mark defining the former and inner edge of latter, which is defined on outer side by an oblique white band from below costa to below vein 4 with sinuous edges; two red lines with silver between them from the semicircular mark to inner margin; a fine terminal line; cilia white and red. Hind wing pale red, the terminal area deep red; cilia white and red; the underside paler.

Hab. Abaco (*P. A. Meers*), 1 ♂ type. *Exp.* 30 mm.

Noctuidæ.

Agrotinæ.

Chloridea armigera, Hübn. Samml. eur. Schmett., Noct. fig. 370 (1827).

Abaco (*P. A. Meeres*).

Chloridea virescens, Fabr. Spec. Ins. ii. p. 216 (1781).

Nassau (*Bonhote*).

Feltia annexa, Treit. Schmett. Eur. v. p. 154 (1825).

Abaco (*P. A. Meers*); Nassau (*Bonhote*).

Lycophotia infecta, Ochs. Schmett. Eur. iv. figs. 67, 68 (1816).

Abaco (*P. A. Meers*).

Hadeninæ.

Leucania unipuncta, Haw. Lep. Brit. p. 177 (1810).

Abaco (*P. A. Meers*).

Acronyctinæ.

Euplexia leucobasis, sp. n.

♀. Head and thorax pale rufous mixed with black; palpi blackish at sides; tegulæ black, mixed with pale rufous; thorax black; tarsi ringed with white; abdomen fuscous, whitish at base, the ventral surface whitish mixed with fuscous. Fore wing fuscous, suffused with greyish and very sparsely irrorated with white; a sinuous subbasal black line from costa to submedian fold; antemedial line waved, oblique from costa to submedian fold, where it is angled, then inwardly oblique; orbicular round, defined by black; a waved medial line oblique from costa to vein 3, and angled

inwards in submedian fold; reniform hardly traceable; postmedial line waved, bent outwards below costa, incurved slightly at discal fold, incurved below vein 4, and angled inwards in submedian fold; the veins of terminal area streaked with black, interrupted by an obscure subterminal series of small dentate greyish marks. Hind wing with the basal half white, the terminal half fuscous black, with its inner edge irregularly diffused.

Hab. Abaco (*P. A. Meers*), 1 ♀ type. *Exp.* 38 mm.

Euplexia scriptura, Wlk. xv. 1723 (1858).

Xylina transversalis, Wlk. xv. 1734 (1858).

Abaco (*P. A. Meers*).

Euplexia subornata, Wlk. xxxii. 682 (1865).

Ochria niveopicta, Butl. P. Z. S. 1878, p. 485.

Abaco (*P. A. Meers*).

Euplexia albigera, Guen. Noct. i. p. 228 (1852).

Nassau; Andros (*Bonhote*).

Euplexia apameoides, Guen. Noct. i. p. 229 (1852).

Andros (*Bonhote*).

Euplexia agnonia, Druce, P. Z. S. 1890, p. 213.

Abaco (*P. A. Meers*); Andros (*Bonhote*).

Magusa orbifera, Wlk. xi. 761 (1857).

Magusa strigifera, Wlk. xi. 763 (1857).

Abaco (*P. A. Meers*); Nassau (*Sir G. Carter*).

Spodoptera vitrina, Wlk. xi. 718 (1857).

Abaco (*P. A. Meers*); Nassau (*Sir G. Carter*).

Caradrina nucicolora, Guen. Noct. i. p. 24, pl. iv. fig. 9 (1852).

Andros (*Bonhote*).

Fagitana parallela, sp. n.

Head, thorax, and abdomen chocolate-brown; tegulæ with medial white line and white tips. Fore wing chocolate-brown, overlaying a pale colour; an oblique white subbasal striga from cell to vein 1; a narrow oblique white ante-

medial band not reaching costa; reniform narrow, faintly defined by white, produced at upper angle and with a prominent white spot at lower angle of cell; a narrow, oblique, slightly curved, white postmedial band; subterminal band represented by a series of slight brown spots; terminal area greyish; an ill-defined white terminal line. Hind wing chocolate-brown; the underside paler, with discoidal point and curved waved postmedial line.

Hab. Abaco (*P. A. Meers*), 1 ♂, 3 ♀ type; Nassau (*Sir G. Carter*). *Exp.* 28 mm.

Caularis lunata, sp. n.

♀. Head and thorax red-brown, mixed with white; fore tibiæ darker above; abdomen pale yellowish, with indistinct brownish dorsal stripe, the ventral surface whitish, irrorated with brown, the basal crest with some metallic scales. Fore wing chocolate-brown, irrorated with white; a white fascia in submedian fold to postmedial line, arising from base of costa; a grey-green streak below median nervure; orbicular and reniform grey-green, with some metallic blue scales at middle; a chocolate postmedial line, oblique towards costa, excurved at middle and incurved below vein 4, broadly defined by white on inner side from costa to submedian fold, and on outer side by grey-green from below costa to inner margin, with a white fascia in submedian fold from it to termen. Hind wing very pale yellow; a large brown discoidal lunule; a terminal pink band with black points on it above vein 2 and at tornus; a fine terminal dark line; cilia white.

Hab. Nassau (*Sir G. Carter*), 2 ♀ type. *Exp.* 38 mm.

Eutelianæ.

Eutelia furcata, Wlk. xxxiii. 815 (1865).

Nassau (*Sir G. Carter*).

Sarrothripinæ.

Paraxia chamæleon, Moschl. Abh. Senck. Ges. xvi. p. 120 (1890).

Thalpochares laurea, Druce, Biol. Centr.-Am., Het. ii. p. 497, pl. xcv. figs. 26, 27 (1898).

Nassau (*Sir G. Carter*).

Noctuinæ.

Parachabora abydas, Herr.-Schäff. Aussereur. Schmett. fig. 565.
Nassau (*Sir G. Carter*).

Casandria filifera, Wlk. xi. 719 (1857).
Andros (*Bonhote*).

Casandria poliotis, sp. n.

Head, thorax, and abdomen grey, slightly mixed with fuscous; tegulæ with dark medial line. Fore wing grey, suffused in parts with fuscous; a curved subbasal line from costa to submedian fold; an oblique waved antemedial line angled outwards above inner margin, with more or less prominent blackish marks before it; orbicular and reniform rather small, defined by fuscous and with fuscous centres, the former round, or the stigmata, also the claviform, represented by small black spots, one specimen with a black streak in submedian fold from base to postmedial line; a rufous or black medial line, oblique from costa to lower angle of cell; postmedial line black, excurved beyond the cell, then incurved; subterminal line indistinct whitish, waved, with diffused rufous or fuscous on its inner side. Hind wing whitish, suffused with fuscous, especially on costal and terminal areas.

Hab. Nassau (*Sir G. Carter*), 2 ♂, 1 ♀ type. *Exp.* 28 mm.

Melipotis ochrodes, Guen. Noct. iii. p. 64 (1852).
Abaco (*P. A. Meers*).

Melipotis marmoraris, Guen. Noct. iii. p. 67 (1852).
Abaco (*P. A. Meers*).

Euglyphia hieroglyphica, Cram. Pap. Exot. pl. cxlvii. D (1779).
Nassau (*Sir G. Carter*).

Litoprosopus hatuey, Poey, Cent. Lép. Cuba (1832).
Andros (*Bonhote*); Nassau (*Sir G. Carter*).

Thermesia flavilineata, sp. n.

♂. Antennæ bipectinate, with short branches; mid-tibia and first tarsal joint fringed with fuscous hair. Head,

thorax, and abdomen grey, the last slightly irrorated with fuscous. Fore wing grey, irrorated with fuscous; traces of slightly waved antemedial and medial lines; reniform small, indistinct; a straight, oblique, postmedial fuscous line, defined on inner side by a pale yellowish line and on outer by fuscous suffusion; subterminal line represented by a series of dark points, excurved from costa to vein 4, then incurved. Hind wing grey, irrorated with fuscous; an oblique fuscous medial line, not reaching costa, defined on inner side by a pale yellowish line and on outer by fuscous suffusion; subterminal line represented by a series of indistinct dark points, excurved at median nervules, then bent inwards to near medial line.

Hab. Nassau (*Sir G. Carter*), 1 ♂ type. *Exp.* 38 mm.

Thermesia gemmatalis, Hübn. Zutr. ex. Schmett. i. p. 26, figs. 153, 154 (1827).

Andros (*Bonhote*); Nassau (*Sir G. Carter*).

Azeta repygnans, Hübn. Zutr. ex. Schmett. iii. p. 37, figs. 575, 576 (1827).

Nassau (*Sir G. Carter*).

Poaphila perplexa, Guen. Noct. ii. p. 304 (1852).

Abaco (*P. A. Meers*); Nassau (*Sir G. Carter*).

Epidromia pannosa, Guen. Noct. iii. p. 326 (1852).

Nassau (*Sir G. Carter*).

Melalectra præcisalis, Hübn. Zutr. ii. p. 29, figs. 367, 368 (1827).

Abaco (*P. A. Meers*).

Bendis hinna, Hübn., Geyer, Zutr. ex. Schmett. 41. 486, figs. 971, 972 (1827).

Abaco (*P. A. Meers*).

Pleonectyptera pyralis, Hübn. Samml. ex. Schmett. i. 23. 64, figs. 127, 128 (1827).

Andros (*Bonhote*); Nassau (*Sir G. Carter*).

Capnodes concinnula, Wlk. xxxiii. 1074 (1865).

Abaco (*P. A. Meers*); Nassau (*Sir G. Carter*).

Acantholipes mesoscota, sp. n.

♀. Head and thorax purplish grey, mixed with fuscous to black; abdomen grey, suffused with brown. Fore wing

purplish grey, irrorated and partly suffused with fuscous; an incurved subbasal line, with a faint waved line beyond it before the slightly waved antemedial line; a fuscous or black band occupying nearly the whole area before the medial line, which is oblique towards costa, then erect; a minutely waved postmedial line, oblique towards costa; subterminal line slightly waved, angled outwards at vein 7 and excurved at middle, some fuscous or black suffusion before it towards costa; a terminal series of black points. Hind wing fuscous brown; the underside grey, irrorated with fuscous; a small discoidal spot and indistinct curved postmedial line.

Hab. Nassau (*Sir G. Carter*), 2 ♀ type. *Exp.* 24 mm.

Cosmophila erosa, Hübn. Zutr. ex. Schmett. ii. 19, figs. 287, 288 (1827).

Abaco (*P. A. Meers*).

Gonodonta acmeptera, Sepp, Ins. Surin. i. 105, pl. xlix. (1848).

Abaco (*P. A. Mears*); Nassau (*Sir G. Carter*).

Erastrianæ.

Callopistria floridensis, Guen. Noct. ii. p. 192 (1852).

Abaco (*P. A. Meers*); Nassau (*Sir G. Carter*).

Baniana metaspilaris, Wlk. xxvii. 126 (1863).

Andros (*Bonhote*).

Ommatochila mundula, Zell. Verh. zool.-bot. Ges. Wien, xxii. p. 460, pl. ii. fig. 4 (1872).

Nassau (*Sir G. Carter*).

Spragueia margana, Fabr. Ent. Syst. iii. (2) p. 709 (1790).

Nassau (*Sir G. Carter*).

Eublemma laphyra, Druce, P. Z. S. 1890, p. 517; id. Biol. Centr.-Am., Het. ii. p. 498, pl. xcvi. fig. 2.

Eublemma rosescens, Hmpsn. Trans. Ent. Soc. 1898, p. 248, pl. xvii. fig. 9.

Abaco (*P. A. Meers*).

Eublemma flammicincta, Wlk. xxxiii. 801 (1865).

Andros (*Bonhote*).

Hypeninæ.

Nodaria selenitis, sp. n.

♂. Antennæ with the shaft knotted at one third; fore tibia with sheath. Head, thorax, and abdomen brown. Fore wing grey-brown, irrorated with brown; an indistinct antemedial line angled outward in and below cell; orbicular a minute fuscous annulus with ochreous centre; reniform a slight ochreous lunule, with black mark on its outer side and oblique dark shade from it to inner margin; postmedial line indistinct, oblique, minutely waved, defined by pale colour on outer side; subterminal area with fuscous suffusion; a black patch at apex and terminal series of small black spots. Hind wing pale, suffused with brown, especially on terminal area; indistinct diffused medial and postmedial lines; a pale waved subterminal line; a terminal series of black points; the underside whitish, irrorated with brown, and the terminal area suffused with brown; a discoidal lunule, waved postmedial line, and pale waved subterminal line.

Hab. Nassau (*Sir G. Carter*), 1 ♂ type. *Exp.* 20 mm.

Nodaria diopis, sp. n.

♀. Head, thorax, and abdomen yellowish brown. Fore wing yellowish brown; a curved, minutely waved, subbasal black line from costa to submedian fold; a curved, minutely waved antemedial line, slightly angled outwards below costa; a medial brown shade, with two minute white-pupilled black discoidal ocelli on it; a minutely dentate black postmedial line, excurved from costa to vein 4, then incurved; a diffused fuscous subterminal line, incurved at discal and submedian folds and somewhat dentate at middle; a terminal series of black points. Hind wing fuscous brown, with minutely dentate medial line and diffused subterminal line; the underside pale, thickly irrorated with fuscous; a discoidal lunule, the lines distinct, the subterminal with waved white line on its outer edge; a terminal series of black points.

Hab. Nassau (*Sir G. Carter*), 2 ♀ type. *Exp.* 30 mm.

Nodaria inostentalis, Wlk. Trans. Ent. Soc. (3) i. p. 112 (1862).

Abaco (*P. A. Meers*); Nassau (*Bonhote*).

Nodaria priassalis, Wlk. xvi. 123 (1858).

Andros (*Bonhote*).

Nodaria utricusalis, Wlk. xvi. 121 (1858).
Abaco (*P. A. Meers*).

Hypena pilosalis, Guen. Delt. & Pyr. p. 33 (1852).
Nassau (*Sir G. Carter*).

Hypena exoletalis, Guen. Delt. & Pyr. p. 29 (1852).
Nassau (*Sir G. Carter*).

Doryodes insularia, sp. n.

♂. Head and thorax white, slightly tinged with violaceous; abdomen ochreous white. Fore wing ochreous yellow, the costal and inner areas violaceous white, slightly irrorated with brown, the veins on costal area with slight dark streaks; a white streak on subcostal nervure expanding beyond the cell, but not reaching the fascia from apex; a black discoidal point and sometimes one towards end of cell; a white fascia in lower part of cell extending to rather beyond lower angle; a yellow-brown fascia below the cell, narrowing beyond it and extending to apex, defining above the curved white fascia from apex to middle of submedian fold and which broadens at middle; termen violaceous white, narrowing to a point below apex; a fine dark terminal line. Hind wing ochreous yellow.

Hab. Nassau (*Sir G. Carter*), 2 ♂ type. *Exp.* 30 mm.

Nearer to *D. bistrialis*, Hübn., than to *D. spadaria*, Guen. = *divisa*, Wlk.

Sphingidæ.

Ambulacinæ.

Ambulyx Carteri, Roths. Nov. Zool. ix. Suppl. p. 180, pl. lxvi. fig. 3 and pl. lvii. fig. 12.
Abaco (*P. A. Meers*).

Chærocampinæ.

Chærocampa irrorata, Grote, Proc. Ent. Soc. Philad. v. p. 52, pl. i. fig. 2 (1865).
Abaco (*P. A. Meers*).

Philampelus vitis, Linn. Syst. Nat. x. p. 491 (1758).
Nassau (*Sir G. Carter*).

Philampelus posticatus, Grote, Proc. Ent. Soc. Philad. v. p. 62 (1865).
Nassau (*Sir G. Carter*).

Philampelus labrusca, Linn. Syst. Nat. x. p. 491 (1758).
Nassau (*Sir G. Carter*).

Anceryx alope, Drury, Ill. Ex. Ent. i. pl. xxvii. fig. 1 (1773).
Abaco (*P. A. Meers*).

Dilophonota ello, Linn. Syst. Nat. x. p. 491 (1758).
Nassau (*Bonhote*) ; Andros (*Neville Chamberlain*).

Dilophonota obscura, Fabr. Syst. Ent. p. 538 (1775).
Abaco (*P. A. Meers*) ; Andros (*Neville Chamberlain*).

Cautethia Grotei, Edw. Pap. ii. p. 10 (1882).
Abaco (*P. A. Meers*) ; Nassau (*Lady Blake*) ; Andros (*Neville Chamberlain*).

Sphinginæ.

Cocytius Duponcheli, Poey, Cent. Lép. Cuba, fig. 4 (1832).
Nassau (*Sir G. Carter*).

Protoparce sexta, Johan. Amœn. Acad. vi. p. 410 (1863).
Nassau (*Sir G. Carter*).

Protoparce afflicta, Grote, Proc. Ent. Soc. Philad. v. p. 71 (1865).
Abaco (*P. A. Meers*).

Protoparce rustica, Fabr. Syst. Ent. p. 540 (1775).
Abaco (*P. A. Meers*).

Protoparce brontes, Drury, Ill. Ex. Ins. ii. p. 53, pl. xxix. fig. 4 (1773).
Nassau (*Sir G. Carter*).

Macroglossinæ.

Enyo lugubris, Drury, Mant. Plant. p. 537 (1771).
Abaco (*P. A. Meers*).

Perigonia lefebræi, Lucas, Sagra's Hist. Cuba, vii. p. 289 (1856).
Abaco (*P. A. Meers*) ; Nassau (*Sir G. Carter*).

Aellopos tantalus, Linn. Syst. Nat. x. p. 493 (1858).
Nassau (*Sir G. Carter*).

Notodontidæ.

Nystalea ebalea, Cram. Pap. Exot. iv. pl. cccx. C (1781).
Abaco (*P. A. Meers*); Nassau (*Sir G. Carter*).

Saturniadæ.

Automeris Hebe, Wlk. xxxii. 536 (1865).
Nassau (*Sir G. Carter*).

Geometridæ.

Boarmianæ.

Merocausta purpuraria, sp. n.

♂. Head, thorax, and abdomen purple-brown, mixed with grey. Fore wing purple-brown, suffused with grey and irrorated with fuscous, the postmedial area more chocolate-brown; an ill-defined antemedial dark line angled on median nervure; a chocolate discoidal spot, with dark line from it to inner margin; a dark postmedial line, excurved from costa to discal fold, then oblique; a diffused dark subterminal line; a terminal series of black points. Hind wing red-brown, with obscure dark striæ and indistinct medial and postmedial lines and subterminal line from vein 3 to tornus; the underside greyer and irrorated with fuscous.
Hab. Nassau (*Sir G. Carter*), 1 ♂ type. *Exp.* 20 mm.

Phrygionis argyrosticta, sp. n.

♂. Antennæ bipectinate, with long branches; yellow; head tinged with brown; abdomen with some dark scales on dorsum. Fore wing with subbasal and two antemedial series of dark points with silvery scales on them, the antemedial series incurved below cell; a curved medial series of similar points with another series beyond it between veins 7 and 2; the terminal area striated with brown. Hind wing with the medial area striated with brown; a postmedial line incurved at discal fold; an indistinct silvery subterminal line; a fiery red terminal band irrorated with silver from apex to discal fold, where there is a small ocellus with semicircular black mark on its outer edge; a fiery red stigma on termen near tornus.
Hab. Abaco (*P. A. Meers*), 1 ♂ type. *Exp.* 34 mm.

Macaria bifilaria, sp. n.

♂. Head, thorax, and abdomen white, the head slightly tinged with rufous. Wings white, irrorated with black and

rufous scales and faintly striated with brown; a dark subbasal point below costa; a curved antemedial line; an oblique rufous striga from middle of cell and indistinct line from origin of vein 2 to inner margin; a discoidal striga; a double postmedial line, the inner grey, the outer rufous, slightly incurved at vein 4 and ending at tornus, some black points before it on the veins; termen excised below apex, with a rufous lunule at the excision and some striæ towards tornus. Hind wing with indistinct antemedial line; a black discoidal point; a double, almost straight line from apex to tornus, the inner grey, the outer rufous; the terminal area strongly irrorated; the termen produced to an acute point at vein 4 and with some terminal black bands.

Hab. Nassau (*Sir G. Carter*), 2 ♂ type. *Exp.* 26 mm.

Tephrina continuata, Wlk. xxv. 1445 (1862).

Andros (*Bonhote*).

Drepanodes moneta, Druce, Biol. Centr.-Am., Het. ii. p. 30, pl. xliv. fig. 2 (1890).

Abaco (*P. A. Meers*); Nassau (*Sir G. Carter*).

Acrosemia dichorda, sp. n.

♀. Purplish red-brown, the wings thickly striated with fuscous. Fore wing with slightly curved antemedial line defined by flesh-colour on inner side; a black discoidal point; an almost straight postmedial line defined by flesh-colour on outer side. Hind wing with black discoidal point; a slightly curved postmedial line defined by flesh-colour on outer side. Underside much paler.

Hab. Abaco (*P. A. Meers*), 1 ♀ type. *Exp.* 38 mm.

Oxydia vesulia, Cram. Pap. Exot. iii. p. 79, pl. ccxl. B, C (1779).

Nassau (*Sir G. Carter*).

Azellina vetustaria, Wlk. xxxv. 1550 (1866).

Nassau (*Sir G. Carter*).

Brotis vulneraria, Hübn. Samml. exot. Schmett. ii. p. 23, figs. 319, 320 (1827).

Nassau (*Sir G. Carter*).

Orthostixinæ.

Mecoceras nitocris, Cram. Pap. Exot. iii. p. 148, pl. cclxxv. A (1779).

Nassau (*Sir G. Carter*).

Zanclopteryx uniferata, Wlk. xxvi. 1634 (1862).
Nassau (*Sir G. Carter*).

Larentianæ.

Cidaria fluviata, Hübn. Samml. eur. Schmett., Geom. figs. 280, 281 (1827).
Abaco (*P. A. Meers*).

Cidaria anomala, Butl. P. Z. S. 1878, p. 491.
Abaco (*P. A. Meers*) ; Andros (*Bonhote*).

Dyspteris abortivaria, Herr.-Schäff. Aussereur. Schmett. fig. 346 (1850).
Andros (*Bonhote*).

Eupethecia miserulata, Grote, Proc. Ent. Soc. Phil. ii. p. 32 (1863).
Abaco (*P. A. Meers*).

Geometrinæ.

Geometra congruata, Wlk. xxii. 511 (1861).
Nassau; Andros (*Bonhote*).

Geometra cupedinaria, Grote, Can. Ent. xii. p. 218 (1880).
Abaco (*P. A. Meers*); Nassau (*Sir G. Carter*) ; Andros (*Bonhote*).

Euchloris heterospila, sp. n.

♀. Yellow-green; palpi and antennæ pink and white. Fore wing with the costal edge pink; an antemedial series of three blackish points on the veins; a discoidal point; a postmedial series of points incurved below vein 2 and with a white spot edged with black and reddish on it between veins 2 and 3, sometimes connected with termen by a reddish streak; cilia reddish, tipped with white. Hind wing with discoidal dark point and curved postmedial series on the veins; cilia reddish, white at tips. Underside greenish yellow.

Ab. 1. Fore wing with the patch on outer side of postmedial points extending from above vein 6 to below submedian fold and formed of a series of conjoined, elongate, white spots edged by blackish and red. Hind wing with elliptical white spots edged with blackish and red on outer side of postmedial points between veins 4 and 2.

Hab. Abaco (*P. A. Meers*), 2 ♀ type; Nassau (*Sir G. Carter*); St. Lucia, 2 ♀. *Exp.* 24–32 mm.

Acidalianæ.

Anisodes calidata, Wlk. xxvi. 1599 (1862).
Abaco (*P. A. Meers*).

Anisodes myrtaria, Guen. Ur. & Phal. i. p. 408, pl. ii. fig. 7 (1857).
Abaco (*P. A. Meers*).

Semæopus micropis, sp. n.

♀. Pale ochreous brown, with a slight olive tinge; head rather darker; wings thickly irrorated with fuscous. Fore wing with minute white-pupilled, fuscous, discoidal ocellus; an indistinct, oblique, dentate, postmedial line bent inwards to costa: a fine brown terminal line. Hind wing with small, white-pupilled, fuscous, discoidal ocellus; an indistinct, almost straight, dentate postmedial line; a fine brown terminal line.
Hab. Nassau (*Sir G. Carter*), 1 ♀ type. *Exp.* 36 mm.

Craspedia turbata, Wlk. xxvi. 1755 (1862).
Abaco (*P. A. Meers*).

Craspedia cymiphora, sp. n.

♂. White, irrorated with fuscous; palpi and frons black; hind tibiæ without spurs, but not dilated. Fore wing with the costal edge fuscous towards base; an indistinct antemedial line excurved from costa to median nervure, then incurved; a prominent black discoidal point; postmedial line incurved at discal and submedian folds; two minutely-waved subterminal lines incurved at discal and submedian folds; a terminal series of brown striæ. Hind wing with prominent, black, discoidal striga; an indistinct postmedial line incurved at discal and submedian folds, with a more prominent line beyond it, strongly incurved at discal and submedian folds; a diffused, waved, subterminal line; a terminal series of brown striæ.
Hab. Abaco (*P. A. Meers*), ♂ type. *Exp.* 20 mm.

Craspedia ossularia, Hübn. Zutr. ex. Schmett. fig. 909 (1837).
Abaco (*P. A. Meers*).

Lasiocampidæ.

Artace punctistriga, Wlk. vi. 1491 (1855).
Abaco (*P. A. Meers*).

Perophoridæ.

Perophora egenaria, Wlk. xxxv. 1575 (1866).

Abaco (*P. A. Meers*); Nassau (*Sir G. Carter*); Andros (*Bonhote*).

Cossidæ.

Duomitus benestriata, sp. n.

♂. Head and thorax white, tinged with brown, the thorax with large, blackish, dorsal patch; palpi and sides of frons blackish. Fore wing whitish, rather sparsely marked with coarse brown striæ, those on costal area before middle black; a small, black, discoidal lunule. Hind wing white, with series of small fuscous spots on the cilia.

Hab. Abaco (*P. A. Meers*), 1 ♂ type. *Exp.* 40 mm.

Psychidæ.

Œceticinæ.

Thyridopteryx ephæmeriformis, Haw. Lep. Brit. p. 72 (1803).

Nassau (*Sir G. Carter, Bonhote*).

Psychinæ.

Thanatopsyche apicalis, sp. n.

♂. Head, thorax, and abdomen black; patagia with large white patches: wings hyaline, irrorated with black hairs, the veins and margins black; fore wing with the terminal half of costal area suffused with black; hind wing with the inner area black.

Hab. Abaco (*P. A. Meers*), 3 ♂ type. *Exp.* 24 mm.

Zygænidæ.

Zygæninæ.

Nesaca albimacula, sp. n.

♂. Black, with a bluish tinge; palpi and frons white; shoulders and metathorax with white spots; base of hind tibiæ streaked with white; abdomen with lateral white streaks at base, followed by a series of white points, and a yellowish spot on terminal segment. Fore wing with fine white streak below the cell and bar-shaped, white, discoidal spot.

Hab. Nassau (*Sir G. Carter*), 1 ♂ type. *Exp.* 20 mm.

Thyrididæ.

Hexeris enhydris, Grote, Can. Ent. vii. p. 176 (1875).
Abaco (*P. A. Meers*).

Pyralidæ.

Crambinæ.

Crambus hastiferellus, Wlk. xxvii. 155 (1863).
Nassau (*Sir G. Carter*); Andros (*Bonhote*).

Crambus profanellus, Wlk. xxxv. 1753 (1866).
Andros (*Bonhote*).

Platytes lacteella, Fabr. Ent. Syst. iii. 2, p. 313 (1794).
Nassau (*Sir G. Carter*).

Dicymolomia pegasalis, Wlk. xvii. 438 (1859).
Abaco (*P. A. Meers*); Nassau (*Sir G. Carter*).

Schœnobianæ.

Scirpophaga leucatea, Zell. Mon. Chil. & Cramb. p. 2 (1863).
Nassau (*Sir G. Carter*).

Scirpophaga perstrialis, Hübn. Samml. exot. Schmett. figs. 457, 458 (1827).
Nassau (*Sir G. Carter*).

Scirpophaga repugnatalis, Wlk. xxvii. 144 (1859).
Chilo funerellus, Hmpsn. A. M. N. H. (7) vii. p. 254 (1901).
Nassau (*Sir G. Carter*).

Scirpophaga holophœalis, sp. n.

♂. Head and thorax brownish grey; abdomen ochreous, the ventral surface brownish grey. Fore wing ochreous grey-brown, the cell and area just below and beyond it slightly darker. Hind wing fuscous brown.

Hab. Abaco (*P. A. Meers*), 2 ♂ type; Brit. Guiana, 1 ♂.
Exp. 28–32 mm.

Phycitinæ.

Euzopherodes megalopalis, sp. n.

♂. Head and thorax reddish brown, tinged with fuscous; tibiæ and tarsi banded with grey; abdomen grey-brown,

with pale segmental lines. Fore wing brown mixed with purplish red and irrorated with grey; the medial costal area fuscous; a patch of grey scales on costa near base; an almost medial, oblique, strong, grey-white, antemedial, straight line; a black discoidal lunule on a grey patch which extends to costa, a strong, grey, postmedial line slightly excurved at middle; some grey on termen. Hind wing semihyaline whitish, the veins and termen tinged with brown; a fine terminal brown line; cilia brownish.

Hab. Nassau (*Sir G. Carter*), 1 ♂ type. *Exp.* 14 mm.

Genus Eutrichocera, nov.

Palpi slender, upturned to above vertex of head; maxillary palpi dilated with scales; antennæ of male with immensely long cilia. Fore wing with the cell very short; veins 3, 4, 5 stalked; 8, 9, 10 stalked; 11 from cell. Hind wing with the cell very short; veins 4, 5 stalked, and 3 approximated to them for some distance; 6, 7 from upper angle, and 8 anastomosing with 7.

Eutrichocera paurolepidalis, sp. n.

♂. Head, thorax, and abdomen grey, tinged with brown. Fore wing thinly scaled, grey tinged with brown and irrorated with fuscous, especially on the veins: the antemedial line represented by tufts of black scales in and below cell and on vein 1; two very indistinct medial lines excurved beyond cell, then incurved; postmedial line defined by grey on outer side and produced to short streaks on the veins, excurved from costa to vein 3, then incurved, and excurved again above inner margin; a maculate, terminal, black line. Hind wing semihyaline white, the veins tinged with brown; a brown terminal line.

Hab. Abaco (*P. A. Meers*), 2 ♂ type. *Exp.* 22 mm.

Phycita (*Pinipestis*) *Zimmermanni*, Grote, Can. Ent. ix. p. 161 (1877).

Abaco (*P. A. Meers*).

Phycita (*Dioryctria*) *abietella*, Schiff. Wien. Verz. x. p. 138 (1776).

Abaco (*P. A. Meers*).

Epipaschianæ.

Tiaga atrifascialis, Hulst, Trans. Am. Ent. Soc. xiii. p. 160 (1886).

Nassau (*Sir G. Carter*).

Macalla thyrsisalis, Wlk. xvi. 156 (1858).
Abaco (*P. A. Meers*).

Chrysauginæ.

Salobrena rubiginea, Hmpsn. P. Z. S. 1897, p. 642.
Nassau (*Sir G. Carter*).

Tetraschistis leucogramma, sp. n.

♀. Head and thorax reddish brown ; hind tarsi whitish; abdomen greyish fuscous. Fore wing purplish grey-brown with slight dark irroration ; rufous patches on costal area before the antemedial and beyond the postmedial lines ; the lines pure white and prominent, the antemedial slightly excurved below costa, then oblique, the postmedial slightly incurved below costa, then excurved ; a fine dark terminal line. Hind wing fuscous brown, with white postmedial line almost obsolete on costal half ; a fine dark terminal line.
Hab. Nassau (*Sir G. Carter*), 1 ♀ type. *Exp.* 22 mm.

Parachma ocracealis, Wlk. xxxiv. 1263 (1865).
Andros (*Bonhote*).

Galasa rubidana, Wlk. xxxv. 1802 (1866).
Abaco (*P. A. Meers*).

Caphys bilinea, Wlk. xxvii. 13 (1863).
Andros (*Bonhote*).

Bonchis munitalis, Led. Wien. ent. Mon. 1863, p. 55, pl. vi. fig. 13.
Nassau (*Sir G. Carter*).

Hydrocampinæ.

Nymphula endoralis, Wlk. xvii. 459 (1859).
Andros (*Bonhote*).

Pyraustinæ.

Symphysa eripalis, Grote, Can. Ent. x. p. 29 (1878).
Nassau (*Sir G. Carter*).

Zinckenia perspectalis, Hübn. Samml. eur. Schmett., Pyr. fig. 101 (1827).
Nassau (*Sir G. Carter*).

Desmia funeralis, Hübn. Samml. eur. Schmett., Pyr. fig. 103 (1827).
Abaco (*P. A. Meers*).

Desmia ufens, Cram. Pap. Exot. ii. p. 2, pl. xcvii. E (1779).
Nassau (*Sir G. Carter*); Andros (*Bonhote*).

Desmia ploralis, Guen. Delt. & Pyr. p. 192 (1854).
Andros (*Bonhote*).

Desmia microstictalis, sp. n.

♀. Black; throat, base of palpi and extremity of second joint, sides of frons, basal joint of antennæ in front, and marks behind antennæ white; metathorax with white spots; pectus mixed with white; legs banded with white; abdomen with medial white band and segmental lines on terminal segments, the ventral surface with white bands. Fore wing with two white points at base; an antemedial bar in cell; a medial round spot in cell and point below the cell; an elliptical patch beyond the cell between veins 7 and 4, with rather dentate outer edge; cilia white at apex and tornus. Hind wing with irregular, antemedial, white patch from below costa to inner margin, followed by a fine white line below the cell; an irregular patch beyond the cell between veins 7 and 3; a fine white terminal line; cilia white at tips, at apex, and towards tornus.

Hab. Abaco (*P. A. Meers*), 2 ♀ type. *Exp.* 24 mm.

Ercta ornatalis, Dup. Lép. Fr. vii. p. 207, pl. ccxxiii. fig. 8 (1831).
Nassau (*Bonhote*).

Pilocrocis gastralis, Guen. Delt. & Pyr. p. 346 (1854).
Nassau (*Sir G. Carter*).

Pilocrocis tristigmalis, Hmpsn. P. Z. S. 1898, p. 659.
Abaca (*P. A. Meers*); Andros (*Bonhote*).

Conchylodes diphteralis, Geyer, Zutr. 24. 346, figs. 691, 692 (1827).
Abaco (*P. A. Meers*); Nassau (*Sir G. Carter*).

Nacoleia zoilusalis, Wlk. xviii. 603 (1859).
Nassau (*Sir G. Carter*).

Nacoleia albicinctalis, sp. n.

♀. Dull reddish brown; palpi at base and throat white; abdomen with white segmental lines to second and third segments, the rest of third segment suffused with black, the other segments with slight black and white lines. Fore wing

with subbasal and broad black antemedial straight lines; a black discoidal spot; some black irroration below cell on medial area; a strong, black, postmedial line defined by white on outer side, angled at vein 4, then incurved. Hind wing slightly tinged with fuscous; a straight, oblique, postmedial line slightly defined by white on outer side; a black terminal line; cilia white at base; the underside whitish, with some black irroration, the costal and terminal areas tinged with brown, a black discoidal point and slightly waved postmedial line.

Hab. Abaco (*P. A. Meers*), 1 ♀ type. *Exp.* 26 mm.

Nacoleia infuscalis, sp. n.

♀. Head and thorax fuscous brown and grey; antennæ annulated with black; tibiæ banded with black. Fore wing pale brownish, irrorated and suffused with fuscous; an ill-defined blackish subdorsal line; an ill-defined, antemedial, slightly curved band; an obscure spot at middle of cell; a pale discoidal lunule defined by diffused fuscous; the postmedial line angled outwards below costa, incurved at discal fold, excurved to vein 2, then retracted to below end of cell; a crenulate terminal line with some whitish beyond it; a black line at base of cilia. Hind wing whitish, irrorated and suffused with fuscous; an oblique medial line; the postmedial line bent outwards at vein 4 and ending on termen above tornus; a crenulate terminal line, except towards tornus, with some whitish beyond it.

Hab. Nassau (*Bonhote*), 1 ♂ type. *Exp.* 12 mm.

Nacoleia binoculalis, sp. n.

♀. Head, thorax, and abdomen pale grey-brown; pectus, legs, and ventral surface of abdomen whitish. Fore wing pale grey-brown, thickly irrorated with fuscous, the costal and terminal areas rather darker; traces of a waved subbasal line; an indistinct, oblique, waved, antemedial line; a small fuscous ocellus in middle of cell and reniform discoidal spot; postmedial line slightly angled inwards at discal fold, at vein 2 retracted to lower angle of cell, then excurved again; a terminal series of fuscous points. Hind wing semihyaline white, the apical area tinged with brown; a discoidal stigma; a fine postmedial line angled inwards at discal fold and obsolete on inner half; a terminal punctiform line.

Hab. Abaco (*P. A. Meers*), 1 ♀ type. *Exp.* 22 mm.

Sylepta ceresalis, Wlk. xviii. 581 (1859).

Nassau; Andros (*Bonhote*).

Lygropia fusalis, sp. n.

♂. Fore wing with the retinaculum formed by a large fan of scales. Head, thorax, and abdomen fuscous brown mixed with whitish; palpi white below; legs white, the fore tibiæ banded with fuscous; abdomen white below, the anal tuft ochreous. Fore wing fuscous grey, with diffused, fuscous, medial band, its outer edge somewhat angled outwards at middle; a patch on costa before apex. Hind wing fuscous grey, the base, costal area to near apex, and inner margin pale yellow; a diffused, fuscous, medial band from cell to above inner margin. Underside yellow; fore wing with the costal area fuscous to beyond middle, confluent with a large patch in and beyond end of cell, with a yellow discoidal spot on it, the terminal area fuscous, broad at costa, narrowing to a point at tornus; hind wing with discoidal lunule and apical fuscous patch.

Hab. Andros (*Bonhote*), 1 ♂ type. *Exp.* 18 mm.

Glyphodes phlegia, Cram. Pap. Exot. ii. p. 66, pl. cxl. D (1779).

Nassau (*Sir G. Carter*).

Glyphodes nitidalis, Cram. Pap. Exot. iv. p. 160, pl. ccclxxi. F (1781).

Abaco (*P. A. Meers*); Nassau (*Sir G. Carter*).

Leucinodes elegantalis, Guen. Delt. & Pyr. p. 222, pl. iii. fig. 8 (1854).

Abaco (*P. A. Meers*); Nassau (*Bonhote*).

Ommatospila narcæusalis, Wlk. xix. 972 (1859).

Nassau (*Sir G. Carter*).

Azochis rufidiscalis, sp. n.

♂. Head and thorax black-brown mixed with rufous, especially on palpi, tegulæ, and metathorax; pectus and legs white; abdomen white, with rufous dorsal patch on second to fifth segments, the anal tuft black at middle. Fore wing white; a blackish and rufous basal patch with curved outer edge; a fuscous and black patch in and beyond end of cell, constricted below the cell and extending to submedian fold, with a small round white spot on it in end of cell, followed by a triangular, rufous, discoidal mark from costa, a rufous point below it on vein 1; a fuscous and rufous postmedial line oblique from costa to vein 5 and ending at tornus; a small,

triangular, black mark on termen between veins 6 and 4 with one or two points above it. Hind wing semihyaline white; a patch of black scales near tornus, with some fuscous scales between it and lower angle of cell; a slight fuscous postmedial line between veins 6 and 4, then excurved to termen; some black on termen between apex and vein 4.

Hab. Nassau (*Sir G. Carter*), 2 ♂ type. *Exp.* 26 mm.

Nomophila noctuella, Schiff. Wien. Verz. p. 136 (1776).
Abaco (*P. A. Meers*); Nassau (*Sir G. Carter*).

Phlyctænodes nasonialis, Zell. Verh. zool.-bot. Ver. Wien, 1873, p. 208, pl. iii. fig. 4.
Abaco (*P. A. Meers*).

Mecyna reversalis, Guen. Delt. & Pyr. p. 409 (1854).
Nassau (*Sir G. Carter*).

Bœotarcha stigmosalis, Warr. A. M. N. H. (6) ix. p. 249 (1892).
Abaco (*P. A. Meers*); Nassau (*Sir G. Carter*).

Pionea subrosea, Warr. A. M. N. H. (6) ix. p. 441 (1892).
Abaco (*P. A. Meers*).

Pionea eupalusalis, Wlk. xviii. 605 (1859).
Abaco (*P. A. Meers*).

Pionea vinotinctalis, Hmpsn. A. M. N. H. (6) xvi. p. 340 (1895).
Andros (*Bonhote*).

Pyrausta mellinalis, Hübn. Zutr. i. 24. 69, figs. 137, 138 (1827).
Abaco (*P. A. Meers*); Nassau (*Sir G. Carter*).

Pyrausta adipaloides, Grote & Rob. Trans. Am. Ent. Soc. i. p. 27, pl. ii. fig. 19 (1867).
Abaco (*P. A. Meers*).

Pyrausta phœnicealis, Hübn. Verz. p. 348 (1827).
Nassau (*Sir G. Carter*).

Pyrausta pyropsalis, sp. n.

♂. Head and thorax red-brown; tegulæ and patagia with some fiery red scales; pectus and legs white, the tibiæ and tarsi banded with brown; abdomen white dorsally tinged

with red-brown. Fore wing red-brown; a fiery red spot at base, the area just before antemedial line and the medial area, except towards costa, fiery red; the antemedial line very indistinct; ill-defined red-brown spots in middle and end of cell; postmedial line indistinct, excurved and minutely waved from costa to vein 3, then retracted to below end of cell; some diffused fiery red on terminal area at apex and below middle; a terminal series of black points. Hind wing ochreous white, suffused with brown towards termen; the underside with traces of postmedial line on costal area.

Hab. Abaco (*P. A. Meers*), 2 ♂; Andros (*Bonhote*), 1 ♂ type. *Exp.* 26 mm.

Stenoptycha pterophoralis, Wlk. xxxiv. 1340 (1865).

Nassau (*Sir G. Carter*).

XXVII.—*New* Callithrix, Midas, Felis, Rhipidomys, *and* Proechimys *from Brazil and Ecuador*. By Oldfield Thomas.

Callithrix penicillata jordani, subsp. n.

Mr. Robert has obtained two series of marmosets referable to *Callithrix penicillata*, Geoff., one from Lamarão, near Bahia, and the other from the Rio Jordão, Province Araguay, Minas Geraes. The former, on geographical grounds, may be regarded as the true *penicillata*, which was simply described as from Brazil, and from this animal the Jordão form appears to differ sufficiently to deserve subspecific distinction.

Size averaging slightly larger than in *penicillata*. General tone of the light colour of the back buffy whitish instead of pure greyish white. Under surface with less black on the throat, this part being grey, only slightly washed with blackish; the black, however, tends to form a black central line over the sternum. Belly and anterior face of thighs strongly suffused with dull yellowish, the hairs of *penicillata* being blackish tipped with white over the whole under surface. Flank-hairs, where overhanging belly, less vividly coloured, their bases dark slaty instead of black; their next ring dull instead of vivid orange, and their subterminal dark band narrower and less conspicuous. Face less brightly picked out with black and white, the white patches below the

eyes almost obsolete, and the centre line between the nostrils pale brownish white instead of pure white. Hands and feet more or less marbled with black and orange instead of clear greyish. Tail-hairs, even near its base, almost or quite without orange rings, the great majority of the hairs being simply black with white tips.

Skull much as in true *penicillata*, but the middle upper incisors show a curious difference in shape; for in *jordani* they are longer, narrower, more parallel-sided, and less strongly convergent towards each other than in *penicillata*, their breadth in the latter about two thirds their length, while it is about half in the former.

Dimensions of the type (measured in the flesh) :—

Head and body 235 mm.; tail 298; hind foot (s. u.) 58; ear 20.

Skull: greatest length 44·5; basal length 32; greatest breadth of brain-case 25; length of nasals laterally 8·6; combined length of premolars and molars 8·8.

Hab. Rio Jordão, S.W. Minas Geraes. Alt. 800 m.

Type. Adult female. B.M. no. 1. 11. 3. 9. Original number 706. Collected 9th June, 1901. Seven specimens.

The yellowish aspect of the belly and inguinal region, the dulled whiteness of the nasal septum, the general absence of yellow on the tail-hairs, and the long narrow incisors are the most tangible characteristics of this inland race of the well-known *Callithrix penicillata*.

Midas Goeldii*, sp. n.

A uniformly dark species, the fur with hoary tips. No special ear or other tufts.

Fur long, soft, and straight; hairs of back and shoulders about 28–30 mm. in length, those of the neck nearly equally long, and therefore projecting laterally far beyond the ears, but not forming special ear-tufts. Muzzle thinly haired; crown and cheeks with hairs 10–15 mm. long, those on the latter directed downwards.

General colour blackish brown, the hairs of back "broccoli brown" at base, darkening outwards to black, the extreme tips (about 1–3 mm.) shining hoary or greyish coppery, which colour is most prominent on the rump, base of tail, and hind limbs. Many of the frontal hairs hoary yellowish throughout. Muzzle and lips blackish. Ears naked behind, a thin fringe of blackish hairs on the outer half of their inner

* In the absence of the skull I cannot be entirely certain that this marmoset is not a *Callithrix* (*Hapale* auctorum).

surface. Under surface thinly haired, blackish throughout. Hands and feet unusually broad, wholly black above, without lighter tipping. Tail like body, blackish, with lighter ends to the hairs.

In addition to the colours above described it should be noted that the type has some irregular and unsymmetrical patches of white hairs on the forehead, side of head in front of the ears, and on the loins; but I think that these are more or less pathological, having grown up on places injured during the animal's life. Marmosets in captivity are commonly fastened by a cord round the loins, and the white patches on the loins are likely to have been caused thereby. There is no trace of the normal marbling of the back so usual in the group.

Skull not preserved.

Dimensions of the type (a skin, which has been stuffed and then dismounted): —

Head and body 190 mm.; tail 255; hind foot (s. u.) 66.

Hab. Amazons; the type brought alive to Pará.

Type. Male. B.M. no. 0. 2. 22. 1. Presented by Dr. E. A. Goeldi, of the Goeldi Museum, Pará.

As may be seen by the note * in Dr. Goeldi's Catalogue of Pará Mammals, this marmoset has been a puzzle for some time, but was provisionally assigned to *M. Weddelli*, Deville. Now, however, that I have had the opportunity of studying the members of the group more closely, I am convinced that it is a form hitherto undescribed, and I am pleased to apply to it the name of its donor, to whom our knowledge of the Pará fauna is so largely due. I still consider, as stated above, that the white patches on the head and loins are abnormal; but apart from these it cannot be referred to *M. Weddelli*, as that species has a white muzzle, marbled back, and rufous thighs, while the uniform hoary-washed blackish of *M. Goeldii* is quite unique.

Midas apiculatus, sp. n.

M. Devillei group.

Muzzle white; head black; nape, shoulders, and outer side of forearms finely grizzled smoky reddish brown (near "burnt umber" of Ridgway); back coarsely mixed black and dull whitish, becoming more reddish on the loins; hips and outer side of legs to ankles dull pale chestnut-rufous, a patch over the knee grizzled like the shoulder colour. Lower

* Bol. Mus. Goeldi, iv. p. 54 (1904).

lips white; throat black, belly dark rufous. Inner sides of fore limbs grizzled rufous, not black as in the other allied species. Upperside of hands and feet more or less grizzled, especially on the metatarsals, with orange-rufous. Tail dark rufous for its basal two inches, then gradually passing into deep black, but there is a hidden rufous ringing to the hairs as far along as the level of the tips of the outstretched hind feet. In *M. Devillei* only the extreme base is rufous or rufous mixed.

Size as in *M. Devillei*. Greatest length of skull 45 mm.

Hab. Copataza River, Upper Pastasa River, Oriente of Ecuador.

Type. Female. B.M. no. 80. 5. 6. 25. Collected between December 1877 and February 1878 by Mr. Clarence Buckley. Three specimens.

This marmoset was formerly regarded by me as *M. Devillei*, Geoff., but it is distinguishable from that animal by the grizzling of the upper surface of the feet, Geoffroy's species having these of a "noir luisant," as has been kindly verified for me on the type by M. Menegaux. And the same is the case in *M. nigrifrons*, Geoff. The extension of the grizzling on the tail to a third of its length before it becomes quite black and the rufous coloration of the inner sides of the forearms are further peculiarities of *M. apiculatus*.

An allied species is *M. tripartitus*, Milne-Edwards *, which alone of this group agrees with *M. apiculatus* in not having pure black feet; but that species has much more strongly defined and contrasted shoulder and body colours, and the outer sides of the thighs are grey instead of being rufous.

M. tripartitus is said by Cabrera † to be the same as *M. lagonotus*, Espada ‡, an identification which the difference in the colour of the feet makes me doubt; but in any case the stated resemblance of Espada's species to Milne-Edwards's figure shows that *M. apiculatus* is different from *M. lagonotus*.

One of the three specimens of *M. apiculatus* has the marbled dorsal hairs profusely mixed with wholly white ones, the general body-colour being thereby rendered of a much paler grey. This is probably due to senility.

The two specimens in the Museum obtained by Mr. E.

* N. Arch. Mus. (2) i. p. 160, pl. iii. (1878).

† An. Soc. Españ. xxix. p. 92 (1900).

‡ 'Algunos datos . . . faun. Amazonas,' p. 14 (Madrid, 1870); J. Sci. Lisb. iii. p. 57 (1871).

Bartlett on the Upper Amazons, and referred by him* to *M. Devillei*, appear also to be referable to *M. apiculatus*, but it is not clear exactly where they were obtained, as his statement that he collected examples both on the Ucayali and Huallaga would appear to have had reference to a larger number of specimens than two, and these individuals may have come from either of the two rivers. Their hands and feet are even more strongly grizzled than are those of the Copataza series.

Felis Wiedii vigens, subsp. n.

Fur of medium length; hairs of back about 13 mm. long. Fur of nape from withers to crown smoothly and completely reversed forwards. Ground-colour comparatively dark, near "clay-colour" on the head, top of neck, and dorsal area, buffy white on sides, and scarcely lighter on belly, not pure white anywhere. Longitudinal lines of nape strongly defined, five in number—a median rather irregular one, split into two in places, and two outer pairs of strong clear ones, the inner of which is continuous with the supraorbital black line. Median dorsal line commencing about a decimetre behind withers, single and well-defined posteriorly, partially split in two anteriorly. Spots of back and flanks oblong, elongate, but rarely lengthened into lines, a slight lighter centre present in some. Throat with three transverse dark lines, the two anterior broken mesially. Chest and inguinal region dull whitish, with few or no spots; belly profusely spotted. Ears with their edges and inner surfaces strong clay-colour; their backs black, with their posterior halves dull buffy whitish, not white, and not succeeded behind by a second black mark, as is usually the case. Limbs coloured like body; the spotting continued on to the metapodials. Palms and soles smoky brown. Tail long, its ground-colour like the body, its dark rings about twelve in number, rather broader than the light ones, mostly broken below; the extreme tip blackish.

Skull with a narrower and more elongate brain-case than is usual in this group, the most convex part barely surpassing in breadth the narrowest point on the ridge above the meatus and considerably surpassed by the broad mastoid ridges, which, in conjunction with the lambdoid crests, are here unusually developed. Nasals large and broad. Bullæ very large, much larger and approaching each other more nearly than in any other skull seen of this group.

* P. Z. S. 1871, p. 220.

Dimensions of the type (measured in the flesh):—

Head and body 560 mm.; tail 405; hind foot (s. u.) 123; ear 55.

Skull: greatest length 100; basal length 87; zygomatic breadth 66; nasals, length (in middle line) 20, breadth 13·7; interorbital breadth 19; intertemporal breadth 33·5; breadth of brain-case 43; greatest mastoid breadth 45·2; least breadth on ridge above meatus 41·7; bullæ, length 24, distance apart 9; length of upper carnassial 11·6.

Hab. Igarapé-Assu, near Pará. Alt. 50 m.

Type. Old male. B.M. no. 4. 7. 4. 43. Original number 1867. Collected 24th April, 1904, by A. Robert. Presented by Oldfield Thomas. One specimen.

This cat clearly belongs to the *F. Wiedii* group, as defined in my paper on the spotted tiger-cats of Brazil *; but it is distinguished from any that I have seen by its large bullæ and comparatively narrow and parallel-sided brain-case, beyond and behind which the broad lambdoid and mastoid ridges conspicuously project. The forward direction of its nape-hairs is unusually smooth and definite, and its light ear-patches are not so white as in specimens from other localities.

Dr. Goeldi has given a pretty figure of the head of this cat in his recent work on the mammals of Pará †.

Rhipidomys pictor, sp. n.

A medium-sized species allied to *R. venezuelæ*.

Size rather less than in *R. venezuelæ*, markedly greater than in *R. dryas*. Fur close and crisp; hairs of back about 6–6·5 mm. in length. General colour above dark fulvous brown, rather more rufous on the sides. Belly and inner sides of limbs white, not very sharply defined, the hairs along the sides of the belly grey basally, the others white to their roots. Ears rather short, pale brown. Outer side of arms and legs dull fulvous; hands and feet thinly haired, whitish, the metatarsals with indistinct browner patches along their outer halves. Tail fairly well haired, the tip with a well-marked pencil whose hairs attain 12 mm. in length; uniformly brown throughout.

Skull very similar to that of *R. venezuelæ*, but smaller. Brain-case rounded, its profile convex; supraorbital edges sharply defined, but not heavily ridged; zygomatic plate not projected forward; palatal foramina well open, not reaching backwards quite to the level of the front of m^1; bullæ small.

* Ann. & Mag. Nat. Hist. (7) xii. p. 234 (1903).

† Prodr. Cat. Mamm. Mus. Pará, p. 30 (1903).

Dimensions of the type (measured in the flesh) :—

Head and body 112 mm.; tail 151; hind foot (s. u.) 25; ear 15.

Skull: greatest length 32; basal length 24·5; zygomatic breadth 17; nasals, length 10·7; interorbital breadth 5·6; brain-case, breadth 15; palate length 12·4; diastema 8·2; palatal foramina 6·3 × 2·4; length of upper molar series 4·7.

Hab. Rio Verde, N.W. Ecuador. Alt. 1000 m.

Type. Adult male. B.M. no. 1. 1. 6. 4. Collected 6th December, 1899.

This *Rhipidomys* appears to be the Ecuadorean representative of *R. venezuelæ*, but it is smaller than either that species or *R. latimanus*, Tomes. It may also be related to my *R. microtis* of Bogota, but has larger ears.

Rhipidomys paricola, sp. n.

A very small species of the *R. dryas* group.

Size almost or quite the smallest of the genus. Fur rather sparse, hairs of back about 6 mm. long. General colour dark rufous grey, much duller than in *R. dryas*; sides but little clearer rufous. Under surface dull creamy white, not sharply defined laterally; the hairs slaty basally, except on the throat and the centre of the chest. Outer aspect of limbs like body, inner whitish, the hind limbs not so white as the anterior ones. Hands and feet dull buffy, the hallucal edges of the metatarsals lighter. Ears of medium size, the anterior part of their backs blackish, contrasting with the general colour. Tail slender, uniformly blackish, not well haired for this genus, the scales scarcely hidden, and the tip with but a slight pencil, of which the hairs are only about 2½ mm. long.

Skull very similar to that of *R. dryas*.

Dimensions of the type (measured in the flesh) :—

Head and body 100 mm.; tail 100; hind foot (s. u.) 22; ear 17.

Skull: greatest length 25; basilar length 19·3; interorbital breadth 4·7; palatine foramina 4 × 2·1; length of upper molar series 4·2.

Hab. Igarapé-Assu, near Pará. Alt. 50 m.

Type. Female. B.M. no. 4. 7. 4. 63. Original number 1872. Collected 29th April, 1904, by Alphonse Robert.

This species is evidently most closely allied to the Ecuadorean *R. dryas*, but may be readily distinguished by its much duller coloration. The recently described *R. rosilla* is also a member of the same group.

Proechimys oris, sp. n.

Most nearly allied to *P. cayennensis* and *P. Roberti*.

General proportions about as in *P. cayennensis*. Spines of back more restricted in their distribution than in that species, the posterior back for nearly a third of its length being spineless; thighs, flanks, and nape also practically without spines. Spines of back about 18 mm. long by 0·7 mm. broad. Lower belly and inner sides of forearms and thighs nearly naked. General colour above dark tawny brown, lined with blackish, the soft-haired rump more rufous; head, sides, arms, and legs greyish brown. In *P. cayennensis* the general colour is darker, the rump brownish, and the back of the hind legs heavily blackened. Hands and feet dull whitish, without special markings. Tail large-scaled, thinly haired, brown above, whitish below.

Skull very like that of *P. cayennensis*, but rather more slender. Interparietal longer antero-posteriorly. Anterior edge of malar forming a long, sharp, forwardly projecting angle at its junction with the maxillary, the corresponding line in *P. cayennensis* being short and obtuse. Palatal foramina well open mesially, but narrowing rapidly behind almost to a point, with little trace of such raised edges as in *P. cayennensis* form two parallel open gutters behind. Base of skull between bullæ narrower than in *cayennensis*.

Teeth as in *P. cayennensis*, the upper ones all simply and uniformly quadrilaminate.

Dimensions of the type (measured by Mr. Robert in the flesh):—

Head and body 245 mm.; tail 174; hind foot (s. u.) 46; ear 21.

Skull: greatest length 58; basilar length 41; zygomatic breadth 26; nasals 21·5; interorbital breadth 12; breadth across parietal ridges 21; palate length 19·5; diastema 11·8; palatal foramina 7 × 3·2; length of upper tooth-series 8·2.

Hab. Igarapé-Assu, near Pará. Alt. 50 m.

Type. Old male. B.M. no 4. 7. 4. 78. Original number 1818. Collected 6th March, 1904, by Alphonse Robert. Seventeen specimens.

This spiny rat differs from *P. cayennensis*, of which the British Museum contains four topotypes obtained by Mr. G. K. Cherrie, by its more rufous colour, especially its much more reddish rump and hind limbs, by the lesser spininess of its posterior back, by the nakedness of its inguinal region, and by the cranial characters above detailed.

Another allied species is *P. Roberti*, Thos., of S. Minas

Geraes, which agrees very closely with *P. oris* in its cranial characters, but differs by its paler and more uniformly buffy colour, its fully haired under surface, and its much longer and softer fur, of which the spines form a less considerable proportion than usual.

In the same locality Mr. Robert also obtained a porcupine allied to *Coendou prehensilis*, but differing by its much darker colour and by the reduction of the white of the bases of the dorsal spines to about 15 or 20 mm. In these respects it agrees with the type of Gray's *C. tricolor*, from which, in the absence of much larger series of different ages, I am unable to separate it.

XXVIII.—*New Bats and Rodents from West Africa, the Malay Peninsula, and Papuasia.* By Oldfield Thomas.

Nyctymene Robinsoni*, sp. n.

Slightly smaller than *N. major*. Ears comparatively large. Fur long, thick, and close; hairs of back about 10 mm. in length. Base of interfemoral membrane above more thickly covered than in the allied species; otherwise the distribution of the fur is similar. General colour above dark, between "wood-brown" and "drab" of Ridgway, the black dorsal line strong and well defined, extending from the withers to the base of the tail. Sides of neck and sides of body below dark "cinnamon," the middle line of neck and chest more greyish. Spotting profuse, the ears as well as the limbs and membranes with many prominent white spots. Ears much larger than in any other species, even slightly exceeding those of the much larger *N. aello*.

Skull broad and heavily built. Frontal profile very convex above the orbits, the upper edge of which is considerably swollen. Second lower premolars with well-marked antero-internal supplementary cusps. Coronoid process well slanted backwards, not so upright or convex as in *N. major*.

Dimensions of the type (measured on the spirit-specimen):—

Forearm 67 mm.

Head and body 100; tail 24; lower leg and foot (c. u.) 41·5; ear 18.

* *Nyctymene*, Bechst. 1800.

Syn. *Cephalotes*, Geoff.; *Harpyia*, Ill.; *Gelasinus*, Temm.; *Uronycteris*, Gray.

Skull: greatest length 32·5; basal length 28; zygomatic breadth 21·7; interorbital breadth 6·1; height of frontal convexity above palate behind cheek-teeth 11·7; upper tooth-row 11·4. Lower jaw: length from condyle to front face of canines 24·3.

Hab. Cooktown, Queensland.

Type. Adult male. B.M. no. 3. 8. 3. 1. Presented by Herbert C. Robinson, Esq. Two specimens.

This fine species is readily distinguishable by its convex skull and large ears, which exceed in length those of its nearest ally, *N. major*, by 3–4 mm.

The only *Nyctymene* hitherto recorded from Australia is the much smaller *N. albiventer*, Gray, which has been taken at Cape York.

Nyctymene major lullulæ, sp. n.

Like *N. major*, but smaller.

Fur of the same very woolly character as is found in *N. major*; hairs of back about 9 mm. long. General colour as in the darker examples of *major*; pale drab above, the dorsal line not very strongly marked. Under surface wood-brown, the sides rather more fawn. Ears as large as in *N. major*, therefore rather larger in proportion to the general size. Wing-membranes and ears profusely spotted.

Skull closely resembling that of *N. major*, but smaller throughout. Frontal profile much less convex than in *N. Robinsoni*, the supraorbital edges sharper. Front of coronoid process of mandible with the convex projection found in *N. major* and not in *N. Robinsoni*.

Dimensions of the type (measured in spirit):—

Forearm 70 mm.

Head and body 100; tail 21; ear 14; third finger, metacarpus 47, first phalanx 37, second phalanx 50; fifth finger 95; lower leg and foot (c. u.) 42.

Skull: greatest length 33; basal length 29·5; zygomatic breadth 21·8; interorbital breadth 5·5; height of forehead above palate 11; upper tooth-row 11·5. Lower jaw: condyle to front face of canines 24·8.

Hab. Woodlark Island, E. of New Guinea.

Type. Old male. B.M. no. 96. 11. 5. 28. Collected, 1896, by Mr. A. Meek. One specimen.

While in nine specimens of *N. major* the useful and exact measurement last given (length of lower jaw from condyle to front face of canines) ranges only from 27·0 to 28·1 mm., in the Woodlark example, an old male, it is only 24·8, a

difference which necessitates the varietal separation of this form. In *N. aello* this measurement is 30·2, in *N. cephalotes* 22·8 to 23·1, and in *N. albiventer* 19·2 to 21·5.

Pipistrellus nanulus, sp. n.

A pigmy species with very short forearm. A bone in the penis.

Size very small. Form fairly stout, the body large in proportion to the short forearms, which are shorter than any hitherto recorded in this genus. Fur of medium length; hairs of back about 4 mm. long. Muzzle thick and broadly rounded, the glandular prominences well developed. Ears rather short, their inner margin straight basally, gradually curving round to form the broadly rounded end to which there is no defined tip; outer margin slightly concave mesially, slightly convex below; basal lobe low, well defined posteriorly. Tragus of medium length, fairly broad, its broadest part opposite the middle of its inner margin; the latter straight or faintly concave, tip blunt, outer margin convex; basal lobe sharply angular. Limbs and feet short; wings to the base of the toes; postcalcareal lobule narrow, distinct; extreme tip of tail projecting; penis with a bone, its prepuce hairy to the tip.

Colour (in spirit) blackish brown above and below. All the membranes also very dark, without lighter edging.

Skull broad and rounded, with large low brain-case and short muzzle; upper profile line practically straight. Base of skull between bullæ broad, its bony edges running outwards quite to the bullæ.

Upper incisors prominently bicuspid; the inner one with its large postero-external secondary cusp falling but little short of the main cusp, and exceeding by about the same distance the top of the outer incisor; secondary cusp of the latter posterior, about halfway up its main cusp. Anterior upper premolar comparatively large, filling up the triangle between the canine and second premolar, which are separated from each other external to it; its tip visible externally just behind the hinder edge of the canine. Lower incisors tricuspid, overlapping.

Dimensions of the type (measured in spirit) :—

Forearm 25·5 mm.

Head and body 41; tail 25; ear 8; tragus on inner edge 2·7; third finger, metacarpus 23, first phalanx 9, second phalanx 12; fifth finger 33; lower leg 10; hind foot 5·6.

Skull: greatest length 11·1; occiput to bottom of nasal

notch 9·5 ; breadth of brain-case 6·1 ; front of canine to back of m^3 3·9.

Hab. Efulen, Cameroons.

Type. Male. B.M. no. 4. 2. 8. 8. Collected by Mr. G. L. Bates.

This bat shares with the larger *P. crassulus* of the same region, also discovered by Mr. Bates, a disproportionately short forearm, the length of this member being less than has been hitherto recorded in any Pipistrelle, and nearly the least of any known bat. From *P. minusculus*, Miller, apparently its nearest ally, *P. nanulus* may be readily distinguished by its rounded ears and other differences in detail.

Kerivoula bicolor, sp. n.

A small species with white-tipped wings.

Size very small, but little larger than *K. pusilla* and *K. minuta*. Build light and delicate throughout. Ears of medium length, reaching, when laid forward, just to the tip of the nose; inner margin strongly convex; tip blunt, the concavity below it not deep. Tragus as in *K. pusilla*, a slight concavity above the process at its outer base. Wings to the base of the toes. Calcars extending three-fifths of the distance towards the tip of the tail.

Fur of medium length ; hairs of back about 7 mm. long (10 mm. in *K. minuta*). Wings practically naked, the base of the interfemoral membrane thinly clothed, and with a few fine hairs on its posterior margin not forming a continuous fringe. Hind legs and feet well covered with longish hairs.

Colour of head and body above (in spirit) apparently fawn-colour or drab, below pure sharply contrasted white. Wings drab-brown, changing abruptly to pure white at their outer ends. On one wing of the type the white extends inwards to about the line of the fifth finger, running also halfway along the edge of the membrane towards the foot; on the other wing it is confined to the part outwards of a line drawn from the tip of the index to the tip of the fourth digit; probably its exact extent is always variable.

Upper incisors slender, bicuspid; the main cusp of the outer reaching to the tip of the secondary cusp of the inner incisor. Upper premolars with their antero-posterior considerably exceeding their transverse diameter, the first slightly larger than the second and smaller than the third.

Dimensions of the type (measured in spirit) : —

Forearm 29 mm.

Head and body 35 ; tail 36; ear 12·5 ; tragus on inner

edge 6·3; third finger, metacarpus 28, first phalanx 12·8, second phalanx 18·5; fifth finger 44; lower leg 13; hind foot (s. u.) 7; calcar 12·7.

Hab. Biserat, Jalor, Malay Peninsula.

Type. Female. B.M. no. 3. 2. 6. 91. Collected and presented by Messrs. H. C. Robinson and N. Annandale.

This beautiful little bat may be readily distinguished from all its allies by its white belly and particoloured wings. Its nearest relation is probably *K. minuta*, Miller *, also from the Peninsula, but besides the differences in colour that species has much longer fur (10 mm. on the back) and very differently shaped premolars.

The type of *Kerivula bicolor* was captured during Messrs. Robinson and Annandale's expedition of 1901 to the Malay Peninsula, but was accidentally overlooked when Mr. Bonhote was preparing his account † of the mammals then obtained.

Emballonura nigrescens solomonis, subsp. n.

Similar in all essential characters to the true *E. nigrescens*, Gray, but markedly larger. The head 14–14·5 mm. in length as against 13·0, the foramen 35–38 as against 32–34, and the fifth finger 37–38 as against 33.

The upper incisors vary in shape, being sometimes flattened and more or less bicuspid, and sometimes conical and unicuspid. In all the available specimens of true *nigrescens* they are unicuspid.

Dimensions of the type :—

Forearm 37 mm.

Third finger, metacarpus 32, first phalanx 9, second phalanx 15; fifth finger, metacarpus 24, first phalanx 8, second phalanx 4·5.

Skull: greatest length 12·8; front of canine to back of m^3 4·7.

In a spirit-specimen the length of the head and body is 40 mm.; tail 10; head 14·3; ear from notch 11·8; lower leg and foot (s. u.) 17·5; calcar 10.

Hab. New Britain group and Solomons. Type from Florida Island, Solomons.

Type. Adult female. B.M. no. 1. 11. 5. 8. Collected 7th January, 1901, by Mr. A. Meek. Other specimens obtained by Rev. G. Brown (1877), H. B. Guppy (1883), and C. M. Woodford (1887–1888).

This is the bat described in the Catalogue as *E. nigrescens*

* Proc. Acad. Philad. 1898, p. 321.

† 'Fasciculi Malayensis,' Zool. i. 1903.

by Dobson, who drew up his account from the example obtained by the Rev. G. Brown in the Duke of York Group, and practically ignored the type, which is not in very good condition. Now, however, I have examined two specimens from New Guinea which agree precisely with the original example in their dimensions and are equally smaller than the many Solomon Island specimens in the Museum Collection. There does not seem to be any difference in the more important characters of the tragus, ear, &c., and I have therefore thought it best to regard the eastern form as only a subspecies of *E. nigrescens*.

Funisciurus Pembertoni, sp. n.

A member of the *F. pyrrhopus* group, with greyish body and bright fulvous limbs.

Size probably equalling that of *F. pyrrhopus*, but the typical and only specimen is immature. General colour above pale olive-grey, quite different to the dark olivaceous of *F. pyrrhopus*. Head like back, without any rufous. Eyelids white. Ears comparatively large, the lower half of their backs and a patch on the head behind them prominently pure white; their ends behind blackish. Sides with the usual white line present but not conspicuous, a slight darkening of the body-colour perceptible below it. Flanks clearer grey. Under surface from chin to anus and inner sides of limbs pure snowy white. Arms and upper surface of hands, legs (but not thighs), and upper surface of feet rich orange-fulvous, much paler than the deep fulvous found in *F. pyrrhopus*. Tail-hairs grey, with black subterminal rings and white tips, those of the end with broad black tips; below the centre line of the tail is greyish, gradually becoming rich fulvous terminally.

Dimensions of the type (young) :—

Head and body 138 mm.; tail 127 ; hind foot 37; ear 14.

Skull: greatest length 41; combined length of m^1 and m^2 3·9.

Hab. Dondo, Cuanza R., Angola.

Type. Half-grown female. Collected 9th June, 1901, by C. Hubert Pemberton.

This brightly marked squirrel, the Angolan representative of *F. pyrrhopus*, is readily distinguishable from that species by the entire absence of rufous from the head, by its much longer ears, the white ear-patches, and the different tone of the rufous of the limbs. No other known species is at all like it.

Uromys Stalkeri, sp. n.

A member of the *U. Bruijnii* group.

Size medium. Fur soft and fine, about 10 mm. in length on the back, straight on the head and body, more woolly on the rump. General colour above uniform cinnamon-brown, scarcely perceptibly ticked or lined; sides but little paler; lateral colour passing on to the edges of the belly; the middle line of the under surface from throat to anus, for a breadth varying from ½ to 1½ inch, pure white, the hairs white to their bases. Head rather greyer, without special orbital or other markings; whiskers very numerous, black. Ears small, brown. Upper surface of hands and feet dull whitish, without darker metapodial patches. Tail of medium length, very finely scaled (scales about 16–17 to the cm.); naked; uniformly brown throughout.

Skull with large, ovoid, convex brain-case and short muzzle; nasals short; interorbital region broad, flat, its edges sharpened but not raised, continuous with the inconspicuous ridges that pass on to the parietals; interparietals large; zygomatic plate scarcely projected forward; palatal foramina short, evenly crescentic; posterior nares widely opened; bullæ small. Teeth of normal proportions.

Dimensions of the type (measured in the flesh):—

Head and body 135 mm.; tail 137; hind foot 27; ear 16.

Skull: greatest length 33·4, basilar length 27, zygomatic breadth 17, nasals 10 × 3·7; interorbital breadth 5·8; brain-case, length 16·7, breadth 14·5; interparietal 4·7 × 9·5; palate length 15; diastema 9·2; palatal foramina 4·9 × 2; length of upper molar series 6.

Hab. Gira R., British New Guinea. Alt. 200 m.

Type. Female. B.M. no. 4. 6. 7. 11. Original number 26. Collected 25th October, 1903, by Mr. W. Stalker.

This species is distinguishable from its allies by its proportionally large brain-case and small muzzle. The narrow area of pure white along its under surface is also characteristic.

In the same locality Mr. Stalker obtained a number of specimens referable to *U. levipes*, Thos.

XXIX.—*New and little-known Bees in the Collection of the British Museum.* By T. D. A. Cockerell.

Anthoglossa cygni, sp. n.

♀.—Length about 15½ mm.

Allied to *plumata*, Smith, and with the same broad second submarginal cell, but differing thus :—Hair on fifth and apical segments of abdomen brown-black (in *plumata* orange-fulvous on fifth); abdomen without bands of any sort, but first segment with white hair laterally, and thin white appressed pubescence on hind margin; hair of sides of mesothorax not tipped with black; mandibles with outer edge convex, but not at all elbowed, and having two short denticles within; labrum shining, ferruginous; face covered with long hair; flagellum ferruginous beneath, except first joint, last joint ferruginous above, with a shining oblique truncation (last joint is red also in *plumata*).

The other species, *A. sericea*, Sm., is distinguished from *plumata* and *cygni* by the thorax being without plumose black-tipped hairs, and the second submarginal cell greatly contracted above.

A. cygni is from Swan River, W. Australia.

Leioproctus Boltoni, sp. n.

♀.—Length 11½ mm.

Shining black with pale greyish-ochreous pubescence, with some black, noticeably on hind part of scutellum, fifth and apical segments of abdomen, and basal part of the long scopa of hind tibiæ. Head broad, facial quadrangle broader than long; clypeus nude, with coarse large punctures; mesothorax shiny, not strongly punctured; tegulæ shining piceous; base of metathorax moderately shining, transversely obtusely ridged, its marginal furrow with only minute rather obscure cross-ridges; stigma large but narrow, it and the nervures dark brown.

♂.—Similar but smaller, with longer antennæ, which are entirely black.

Hab. New Zealand (*Col. Bolton*, 1854).

This is a *Dasycolletes*, but I am unable to separate that genus from *Leioproctus*. It differs from *Leioproctus metallicus* (*Dasycolletes metallicus*, Smith) by the absence of green colour on the abdomen, black hair at apex of abdomen and on base of hind tibiæ, rather longer and narrower abdomen, &c. From

L. vestitus (*Dasycolletes vestitus*, Sm.) it differs by its larger size, brown-black instead of purple-black abdomen, decidedly yellowish tint of pubescence, and longer and looser scopa of hind tibia; but it is closely allied. These comparisons are based on females; the male *L. Boltoni* differs from male *L. purpureus* (*Dasycolletes purpureus*, Sm.) by its larger size and differently coloured abdomen and antennæ.

L. imitatus, Sm., differs from *L. Boltoni* by its smaller size, with the abdomen faintly purplish, and the hair on outer side of hind tibiæ not black at base. The abdomen is really only faintly æneous, not distinctly purple as in *vestitus*, and not so shining. The size of *vestitus* and *imitatus* is the same, and they are quite congeneric.

Leioproctus confusus, sp. n.

♀.—Similar to *L. imitatus*, but first recurrent nervure joins second submarginal cell much before its middle (at its middle in *imitatus*), and basal area of metathorax transversely striate (not so in *imitatus*). Stigma well-developed; hind spur of hind tibiæ very finely pectinate, or could be called long-ciliate; second recurrent nervure practically straight; abdomen without hair-bands. The wings are yellower than in *imitatus*, and the abdominal segments have dark reddish hind margins.

Hab. New Zealand.

The characters are few, but quite sufficiently distinctive. With this and the last, the New-Zealand bee-fauna numbers 18 species.

Saropoda alpha, sp. n.

♂.—Differs from *S. bombiformis*, Sm., by its smaller size (length less than 12 mm.), hair on hind tarsi entirely black, except a small orange tuft at base above; lateral margins of clypeus with a rather broad black band; flagellum ferruginous beneath except base of first joint; legs dark, though with much orange hair, *i. e.* covered above with orange hair, beneath with black, except that hind tarsi are as just described; the bidentate apex of abdomen covered with black hair (fulvous in *bombiformis*).

Hab. Australia.

This is Smith's var. *a* of *S. bombiformis*; it is evidently a distinct species. It has a rather strong superficial resemblance to the Mexican *Emphoropsis fulvus* (*Habropoda fulva*, Sm.).

Ctenoplectra vagans, sp. n.

♂.—Runs to *C. chalybea* in Bingham's table, and is in fact

almost exactly like *chalybea*, of which I have examined the type, a female from Celebes. *C. chalybea* has the ocelli large and fulvous (as also have *C. apicalis*, ♂, and *C. terminalis*), but in *vagans* they are black and more or less aborted, especially the lateral ones. *C. chalybea* has two widely separated dentiform processes on labrum just below clypeal margin, but these are absent from *C. vagans*, *C. apicalis*, ♂, and *C. terminalis*. *C. chalybea* has the face considerably broader below, and the abdomen less decidedly purple than in *C. vagans*, but these differences are probably sexual.

Hab. Philippine Is., two examples.

Ashmead, in his recent list of Philippine Hymenoptera, does not cite any species of *Ctenoplectra*. The genus has hitherto been known from Burmah, Malacca, Celebes, and Natal. In *C. apicalis*, ♂, the apex of the abdomen is prolonged into long processes laterally, but in *C. vagans* the processes are quite short, and the apical projection is more pointed.

C. terminalis, Sm., from Natal, is remarkable for the brilliant blue of its abdomen.

Macrotera secunda, sp. n.

♀.—Length about 9 mm.

Differs from *M. bicolor* thus:—Abdomen piceous, broad hind margins of the segments and most of fifth segment dark rufous; fimbria dull white; marginal cell shorter and broader; mesothorax shining, with well-separated or scattered punctures of various sizes; clypeus shining, smooth in middle, at sides with some rather large punctures (in *bicolor* it has large well-separated punctures all over); supraclypeal area also shining. Long tongue and hairs on tibiæ (long and curved) as in *bicolor*. Scutellum with a median shining impunctate space; metathorax coarsely rugose at extreme base only; ventral surface of abdomen ferruginous clouded with fuscous, hind margin of first segment shallowly emarginate.

Hab. Mexico.

Chalicodoma combusta (Smith).

Port Natal.

In the interleaved copy of the Cat. Hym. B. Mus. in the Museum the late Mr. F. Smith has written this note:—"*Megachile cœlocera* is the male of *M. combusta*: the nest has been received from Heer Guienzius; it resembles that of *Chalicodoma muraria*; to the latter genus *M. cœlocera* must

be removed." I do not find that this information has been published, and in Dalla Torre's Catalogue *cælocera* and *combusta* remain as two species of *Megachile*. The name *combusta* has priority of place.

Dianthidium Latreillei (Lep.).

Anthidium latreillei, Lep.

France.

Dianthidium apicale (Cress.).

Anthidium apicale, Cresson.

Mexico.

Dianthidium orizabæ (Dalla Torre).

Anthidium atriventre, Smith.

Mexico.

Dianthidium impatiens (Smith).

Anthidium impatiens, Smith.

Mexico.

Dianthidium flavolineatum (Smith).

Anthidium flavolineatum, Smith.

Mexico.

Dianthidium bicoloratum (Smith).

Anthidium bicoloratum, Smith.

Mendoza, Argentine.

Dianthidium steloides (Spinola).

Anthidium steloides, Spin.

Chile.

Hair at sides of clypeus black; tegulæ bright orange-fulvous; wings orange basally, and fuliginous beyond that. The colour of the wings reminds one of *Osmia laboriosa*, Sm.

Dianthidium confusum (Smith).

Anthidium confusum, Smith.

Mendoza, Argentine.

Dianthidium lunatum (Smith).

Anthidium lunatum, Smith.

Clypeus all black in female.

Dianthidium indescriptum (Dalla Torre).

Anthidium cognatum, Smith.

S. Paulo, Brazil.

♀. Abdomen black without light markings. Dalla Torre wrongly gives the locality as Mexico.

Dianthidium multiplicatum (Smith).

Anthidium multiplicatum, Smith.

S. Paulo, Brazil.

A very extraordinary insect; mandibles with a great process directed upwards; a large process on face.

A. maculatum, Sm., *A. deceptum*, Sm., *A. chilense*, Spin., and *A. coloratum*, Sm., all belong to *Anthidium* proper.

Parevaspis basalis, Rits.

Java; Japan; China.

The specimens in the collection from these countries appear to belong to a single species, though the Java insect has a lighter red abdomen than the others, and a Japanese example has a little black at the base of the first abdominal segment. The original type of *P. abdominalis*, Smith, is from Celebes, and while it is very similar to *basalis*, as here understood, it differs (♂) by its narrower abdomen (which is of the darker shade, as in Japanese and Chinese examples of *basalis*), with the median apical projection broad and slightly inclined to be notched, whereas in *basalis* it is narrow and spine-like.

Epiclopus Gayi, Spinola.

Melecta chilensis, Smith, is a synonym. The male has the clypeus covered with a sort of roof of appressed white hair.

Morgania dichroa (Smith).

Pasites dichrous, Smith.

Sierra Leone (*Rev. D. F. Morgan*).

Head and thorax black, abdomen shining red, the general effect like some Larrid wasp; hind coxæ large and long, so that hind legs appear to spring from abdomen; marginal cell obliquely truncate and appendiculate; two submarginal cells; basal nervure passing a short distance basad of transverso-medial; scutellum strongly bilobed; maxillary palpi very short.

Morgania carnifex (Gerst.).

Omachthes carnifex, Gerst.

Cape of Good Hope.

Morgania histrio (Gerst.).

Omachthes histrio, Gerst.

Cape of Good Hope.

Oxystoglossa decorata, Smith.

Type ♀. Jamaica.

Second submarginal cell very narrow; eyes emarginate; hind spur of hind tibia strongly curved, simple.

Rhathymus quadriplagiata, Smith.

Mexico.

This species shows an extraordinary resemblance to *Scolia guttata*, Burm. Ashmead gives the maxillary palpi of *Rhathymus* as 4-jointed; but this must be a slip of the pen, as they are actually absent, as Gerstaecker and others have stated. In *Eurytis funereus*, Sm., which looks like *Rhathymus atra*, Sm., they are 3-jointed (the first and third joints very short, second very long), not 1-jointed as Smith states. This observation is based on Smith's type.

XXX.—*The Halictine Bees of the Australian Region.*

By T. D. A. Cockerell.

The Halictine bees of Australia were studied and described many years ago by Mr. F. Smith: since his death they have received practically no attention; and owing to the brevity of the published descriptions and the complete absence of tables for identification the recognition of the species has seemed difficult. The following tables and notes are based on an examination of Smith's types in the British Museum, and it is hoped that they will make it easier for entomologists to further elucidate the subject. There can be no doubt that any resident of Australia who will collect and study these bees will find many new species.

The following abbreviations are used:—(T.) = type specimen examined; s. m. = submarginal cell; r. n. = recurrent nervure; b. n. = basal nervure; t. c. = transverso-cubital

nervure ; t. m. = transverso-medial nervure ; hind spur = hind spur of hind tibia ; area = basal area of metathorax.

Parasphecodes, Smith.

Similar to *Halictus*, but with head and thorax black and abdomen red or largely so. Males with clypeus yellow, except at sides above. This genus does not differ from *Halictus* in any good structural character, and its separation is only justified by the fact that it includes a compact and easily recognized group of species. In his generic diagnosis Smith says that the first r. n. always meets the second t. c. ; but this is not invariably the case. So far as I know, the hind spur of the female is always without spines or teeth. The following table separates Smith's species :—

♂.

First r. n. entering basal corner of third s. m. ; size smaller ; abdomen red, with only the apex slightly blackish ; flagellum entirely black	*sulthica*, Sm.	(T.)
First r. n. entering second s. m. not far from its end	1.	
1. Flagellum ferruginous beneath ; size rather large ; a black cloud on third abdominal segment and segments 4 to 6 all black ; area coarsely wrinkled	*altichus*, Sm.	(T.)
Flagellum entirely black	2.	
2. Area rugose-granular ; middle femora very dark.	*stuchila*, Sm.	(T.)
Area longitudinally plicate ; middle femora clear red	*hilactus*, Sm.	(T.)

♀.

First r. n. entering second s. m. near apex ; red of abdomen quite bright ; area often without longitudinal ridges or wrinkles	1.	
First r. n. meeting second t. c. ; red of abdomen darker or duller ; area with longitudinal ridges or wrinkles	3.	
1. Abdomen red, only faintly blackened apically ; area dull, without distinct wrinkles or ridges ; hind spur simple ; second s. m. higher than broad	*lithusca*, Sm.	(T.)
Abdomen with segments 1 to 3 red, 4 and 5 black.	2.	
2. Smaller ; red of abdomen very bright, hind margins of segments 1 and 2 darker ; clypeus with few large punctures on a shining surface ; mandibles strongly dentate ; hind spur simple ; second s. m. about as high as broad	*tuchilas*, Sm.	(T.)
Larger ; red of abdomen darker, chestnut colour, hind margins of segments 1 and 2 not darkened ; area with a delicate raised sculpture ; hind spur simple ; second s. m. very broad,		

broader than high, and nearly as large as third	*lichatus*, Sm.	(T.)
3. Larger; abdomen shining very dark chestnut, blackened apically; ridge behind area very prominent; second r. n. and third t. c. much weakened	*tilachus*, Sm.	(T.)
Smaller; abdomen not so dark	4.	
4. Area with fine wrinkled ridges; abdomen dull and rather hoary; second s. m. about square	*lacthius*, Sm.	(T.)
Area with fine straight ridges	5.	
5. Wings strongly yellowish	*taluchis*, Sm.	
Wings clear	*hiltacus*, Sm.	

P. talchius, Sm., I have not seen. It is described from a male, the face thickly covered with yellow pubescence, and the basal margins of the second and third abdominal segments depressed. The following two new species are in the British Museum :—

Parasphecodes melbournensis, sp. n.

♀.—Length about 11 mm.

Wings dusky, stigma dark red-brown; second s. m. higher than broad, first r. n. meeting second t. c.; clypeus shining, with large sparse punctures; antennæ wholly black; pubescence pale fulvous; legs dark; metathorax sharply truncate, the upper lateral corners of the truncation prominent; area broad, without a shining rim, its surface dull and minutely roughened, the basal two fifths covered with little ridges; abdomen rather long, not very shiny, bright red, with extremely minute punctures on segments 1 and 2; first segment largely clouded with blackish; extreme apex blackish; venter lighter and more yellow, the hind margins of the segments darker.

Hab. Melbourne, Australia (collection of F. Smith).

From *P. melbournensis* (1) *P. taluchis* differs by the better defined area, with the wrinkles covering its surface, the lighter stigma, &c.; (2) *P. hiltacus* differs by the smaller, darker, and more shiny abdomen, the upper angles of metathoracic truncation not at all prominent, the striæ practically covering area, &c. The area of *P. melbournensis*, partly striate or ridged and partly not, is especially distinctive.

Parasphecodes Frenchi, sp. n.

♀.—Length about 9 mm.

Clypeus shining, with large close punctures; tegulæ shining piceous, white in front; pubescence white, faintly

tinged with ochreous dorsally; legs black; upper corners of metathoracic truncation not at all prominent; area semilunar, with a shining rim, its surface with nearly straight longitudinal ridges, evanescent posteriorly, but extending over more than half the surface; abdomen broad, very dark chestnut-red, beyond second segment strongly blackened, but not black; *sides of second and third segments each with a triangular basal patch of white tomentum*; venter strongly blackened; wings almost clear, dusky at apex; stigma sepia, nervures dark brown; first r. n. meeting second t. c.; second s. m. a little higher than broad.

Hab. Melbourne, Australia, June 26, 1892 (*French*).

From *P. Frenchi* (1) *P. hiltacus* differs by its lighter abdomen, without the lateral hair-patches, &c.; (2) *P. tilachus* differs by being larger, with the area shorter and the lateral hair-patches of abdomen wanting, &c.

Halictus.

The following table is based on the specimens in the British Museum:—

	Species large or middle-sized, not minute*	1.
	Species minute, about 5½ to 6½ mm. long.	9.
1.	Postscutellum with a patch of bright orange tomentum; third abdominal segment with a well-defined large basal patch of bright orange tomentum, ending abruptly on each side in the subdorsal region; legs mainly red; sides of upper border of prothorax covered with bright orange tomentum; marginal cell and beyond and vicinity of basal nervure suffused with fuliginous; area dull, not wrinkled or striate: ♀, length 9½ mm. (S. Australia.)	*peraustralis*, sp. n.†
	Postscutellum without such a patch..	2.
2.	Legs red, or largely so	3.
	Legs black, or almost	4.
3.	Larger; legs dusky red; bases of second and third abdominal segments with a broad band of orange tomen-	

* In all these the first r. n. meets the second t. c., except that it is just in the apex of second s. m. in *H. conspicuus* and *H. repræsentans*.

† *H. peraustralis* is labelled in the Museum *H. bicingulatus*, var., but it appears to be a valid species.

tum; upper margin of prothorax with orange tomentum; tegulæ fulvous..	*bicingulatus*, Sm., ♀ (n. syn.: *rufipes*, Sm., *tertius*, D. T.).
Smaller; tibiæ and tarsi clear red; abdomen without bands, but with conspicuous patches of ochry-tinged white tomentum at lateral bases of segments 2 to 4; tegulæ lively fulvous; hind spur simple.....	*conspicuus*, Sm., ♀. (T.)
4. Larger; abdomen black, punctured, without hair-patches; hind spur simple.....	*carbonarius*, Sm., ♀. (T.)
Smaller; abdomen with hair-patches..	5.
5. Stigma black, or practically so; area very finely and minutely wrinkled ..	*oblitus*, Sm., ♀. (T.)
Stigma brown or reddish.....	6.
6. Clypeus with a yellowish-white band; face with much white hair; whole insect very hairy	*lanuginosus*, Sm. (T.)
Clypeus all black	7.
7. Area with strong regular striæ. (Tasmania.)	*repræsentans*, Sm., ♀. (T.)
Area more feebly and irregularly sculptured	8.
8. Larger and more hairy	*lanarius*, Sm., ♀. (T.)
Smaller and less hairy.....	*convexus*, Sm., ♀. (T.)
9. Abdomen green; mesothorax with a very bright green colour, but dull surface; scutellum shining	*floralis*, Sm., ♀*. (T.) (n. syn. *vividus*, Sm.)
Abdomen red, at least in part; mesothorax green, which separates these species from *Parasphecodes*	10.
Abdomen black or dark brown	12.
10. Mesothorax with very large shallow punctures; abdomen very shiny, red at sides	*punctatus*, Sm., ♀. (T.)
Mesothorax with minute punctures ..	11.
11. Mesothorax very shiny; abdomen red, with only first segment darkened ..	*vitripennis*, Sm., ♀. (T.)
Mesothorax duller; abdomen with the apical part dark.....	*sphecodoides*, Sm., ♀. (T.)
12. Mesothorax black; abdomen dark brown, segments 3 to 5 pilose; second r. n. and third t. c. almost obsolete. (Tasmania.)	*globosus*, Sm., ♀. (T.)
Mesothorax green or blue	13.
13. Mesothorax peacock-green; abdomen shining; hind spur with 3 spines ..	*urbanus*, Sm., ♀. (T.)
Mesothorax dark	14.

* *H. floralis* is from Australia; Dalla Torre erroneously gives the locality as New Zealand.

14. Mesothorax small and shining; abdomen shining black.....	*humilis*, Sm., ♀. (T.)
Mesothorax dull	15.
15. Larger; mesothorax greener; abdomen dark brown, with a sericeous surface.....	*inclinans*, Sm., ♀. (T.)
Smaller; mesothorax bluer; abdomen shining black. (Tasmania.)	*limatus*, Sm., ♀. (T.)

There are three Tasmanian species, *H. familiaris* (Erichs.), *H. orbatus*, Sm., and *H. cognatus*, Sm., which I have not examined. The last, according to Smith, is probably the male of *H. globosus*, Sm.

The presence of ordinary-looking small *Halicti* in the most remote regions is rather remarkable. The following are from New Zealand and Christmas Island (Indian Ocean). The latter locality does not belong to the Australian region, but it is so near to it that its species are of interest in the present connexion.

Halictus Smithii, D. T. (*familiaris*, Sm.), ♀ (T.). New Zealand.—Ordinary-looking small black species; hind spur simple; stigma fulvous; first r. n. meets second t. c.; basal nervure very strongly bent.

H. sordidus, Sm., ♀ (T.). New Zealand.—Ordinary small species; head and thorax black, abdomen *very* dark reddish brown; first r. n. joins second s. m. a short distance before its end.

H. Binghami, W. F. Kirby, ♀ (T.). Christmas Island.—Ordinary-looking small black species; hind spur with very few spines; area large, with fine raised lines, like the veining of a fern-leaf; second and third abdominal segments with basal hair-bands; third s. m. rather large, but its outer side with only a single gentle curve.

H. Andrewsi, W. F. Kirby, ♀ (T.). Christmas Island.—Smaller than *Binghami*; yellowish green, with red legs; venation of *Chloralictus*; hind spur with few long saw-like teeth.

XXXI.—*On* Munidopsis polymorpha, *Koelbel, a Cave-dwelling Marine Crustacean from the Canary Islands.* By W. T. Calman, D.Sc.

The British Museum (Natural History) has lately received from Mr. Fairfax Prevost some specimens of a Galatheid Crustacean collected by him in a cave on the island of

Lanzarote. They belong to the species described by Dr. Koelbel under the name *Munidopsis polymorpha* from specimens collected in the same locality by Prof. Simony *. Koelbel's account of the species and of its remarkable habitat appears to have been overlooked by subsequent writers on the Galatheidæ †, and it may be worth while therefore to draw attention to it again.

The cave in which these Crustacea are found forms part of an extensive system of caverns known collectively as the "Cueva de los Verdes" ‡, ramifying through the lava-beds in the northern part of the island. In one of the chambers, at a distance of about half a kilometre from the sea, there is a pond or small lake of salt water, which communicates with the sea by subterranean channels, the water in it rising and falling with the tide §. The size of the pond is given by Prof. Simony as about 40 metres in length by 15 to 20 metres in breadth, with a depth of 2 to 8 metres. The cavern is dimly lighted by an aperture in the roof. Mr. Prevost found in the water no vegetable or animal life other than the *Munidopsis*, which is sometimes present in large numbers. The animals are described as being of a "pale reddish yellow" colour when alive, and Prof. Simony adds that they "erscheinen vermöge der Wirkung complementärer Farben fast weiss." This remark is explained by Mr. Prevost's statement that in the dim light of the cave the water appears of a beautiful blue colour.

As regards the characters of the species, I am unable to add anything of importance to Koelbel's excellent and minute description. The great variation which he found in the shape of the rostrum and the armature of the carapace, and which is alluded to in the specific name, is well exhibited in the series of specimens examined by me. The exact position of the species in relation to the very numerous species of *Munidopsis* described since Koelbel's paper was written is not easy

* Koelbel, "Beitr. z. Kennt. d. Crustaceen d. Canarischen Inseln," Ann. naturhist. Hofmuseums, Wien, vii. (3) p. 109, pl. x. figs. 3–16 (1892).

† The species is omitted from Dr. Benedict's list of the Galatheidæ, Proc. U.S. Nat. Mus. xxvi. pp. 300–334 (1902), although the reference duly appeared in the 'Zoological Record' for 1892.

‡ For a general account of the caves see Hartung, "Die geologischen Verhältnisse der Inseln Lanzarote und Fuertaventura," Neue Denkschr. allg. Schweiz. Ges. ges. Naturwiss. xv. (4) p. 81 (1857), where, however, the pond is not mentioned.

§ A sample of the water brought home by Mr. Prevost has been analysed by Mr. A. J. Robertson, B.Sc., of University College, Dundee, who kindly informs me that it has a salinity of 35·39 per mille, which is probably about the same as that of the sea outside.

to determine. Milne-Edwards and Bouvier *, in their arrangement of the "Galathéens non flagellés," attach primary importance to the shape of the antero-lateral angle of the carapace. This angle is stated to be spiniform in the genera *Galacantha, Munidopsis*, and *Galathodes*, while it is "obtus, ou formant un lobe saillant, parfois aigu," in *Elasmonotus* and *Orophorhynchus*. Later writers are in agreement that the division of genera is here carried too far, and Faxon †, Alcock ‡, and Benedict § recognize only the two genera *Galacantha* and *Munidopsis*, the latter including *Galathodes*, *Elasmonotus*, and *Orophorhynchus*, which by Alcock are ranked as subgenera. The great variation in the shape of the antero-lateral angles in the present species seems to support this view, since they are sometimes spiniform as in *Munidopsis* (s. str.), sometimes rounded as in *Elasmonotus* and *Orophorhynchus*. Apart from this character and the occasional absence of the rostrum, however, the species appears to find its most natural place among the forms composing the subgenus *Munidopsis*, with which it agrees in having the rostrum (when it is present) styliform in shape, the chelipeds of the male longer than the ambulatory legs, the eye-stalks not prolonged into spines, and the lateral borders of the carapace not subcristiform. From all the species of this group it is distinguished by, among other characters, the great reduction of the rostrum, which, at most, does not exceed twice the length of the eye-stalks.

Of the 102 species of *Munidopsis* (s. lat.) enumerated by Dr. Benedict, 21 are recorded from depths less than 300 fathoms, and of these only 2 are found in less than 100 fathoms, viz. *M. Tanneri*, Faxon, from 85 fath. in the Gulf of Panama, and *M. polita* (S. I. Smith), from 79 fath. off N.E. America ‖.

As in all the other species of the genus, the eyes of *M. polymorpha* are very small and entirely without pigment and the cornea is not facetted externally. The eye-stalks are short, obtusely conical, and rounded at the apex; they are very slightly movable. In these characters and in the small number and large size of its eggs *M. polymorpha*

* "Considérations générales sur la famille des Galathéidés," Ann. Sci. Nat. (8) xvi. p. 260 (1894).

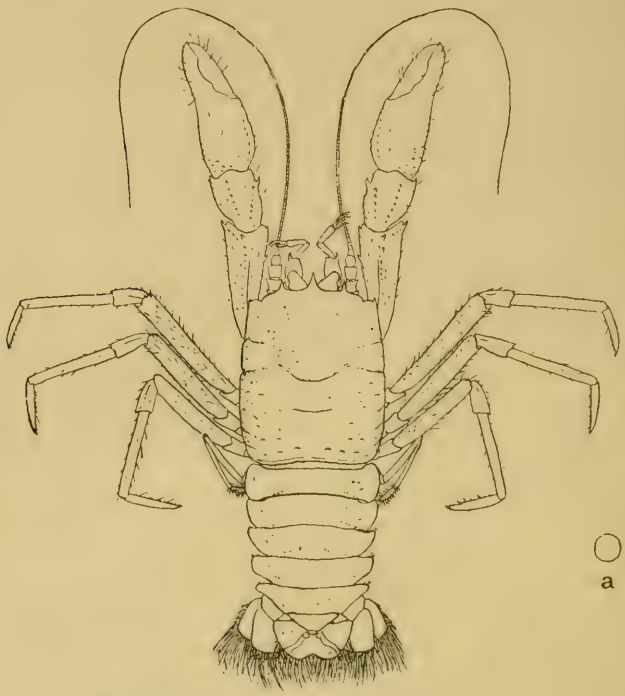
† Mem. Mus. Comp. Zool. Harvard, xviii. pp. 81–83 (1895).

‡ Cat. Indian Deep-Sea Crust. Macrura and Anomala, p. 248 (1901).

§ Proc. U.S. Nat. Mus. xxvi. p. 244 (1902).

‖ *Munidopsis tridentata* (Esmark), which occurs in the deeper parts of the Norwegian fjords, may perhaps extend into depths of less than 100 fathoms; but I cannot find any definite statement on the subject.

differs markedly from all the littoral and shallow-water species of Galatheidæ, which have well-developed eyes and numerous small eggs.



Munidopsis polymorpha, Koelbel, female, × 3.
a. One of the eggs, on same scale.

I have been unable to find any record of a marine animal living under conditions similar to those described for *M. polymorpha*. Many littoral forms are known to haunt caves on the sea-coast, but none of these show special adaptations to this habitat and none are specially related to abyssal forms. It would be of great interest to ascertain whether the species or any related forms occur on the shore or in shallow water in the neighbourhood of Lanzarote. In view, however, of the exclusively deep-sea habitat of the other species of the genus this is unlikely. It seems more probable that the present inhabitants of the cave are the descendants of some deep-water species which, having been carried * into the fissures by

* Chun has given an interesting account of the way in which animals

which the cave communicates with the sea, found there an environment suitable, at least in the absence of light, to its habits.

It is possible that this case may have some bearing on the general question of the origin of the subterranean fauna. It has been stated, more especially with regard to the Crustacea, that the subterranean forms are allied, not to the surface-living freshwater species, but to marine and, in some cases, deep-sea forms. Some of the cases formerly adduced in support of this view have been disposed of by subsequent criticism *, but a few forms still remain which appear to be distinctly of a marine type. Among these the Isopod *Cruregens*, described by Prof. Chilton from wells in New Zealand, belongs to an otherwise exclusively marine family, the Anthuridæ. The same may be said of Dr. Benedict's *Cirolanides* † and the *Cirolana cubensis* recently described by Mr. Hay ‡, both belonging to the Cirolanidæ, while in some other cases an affinity with freshwater forms seems to have been assumed rather than demonstrated. Among the other groups of subterranean animals the most striking case in point is that of the two fishes *Lucifuga subterraneus* and *Stygicola dentatus* § found in caves in the island of Cuba, to which Mr. Boulenger has kindly directed my attention. These belong to the Brotulidæ, a family which has no other representatives in fresh water, the great majority of the genera coming from deep water, although some are shallow-water or shore fishes. The nearest allies of the cave-fishes are stated to be the genera *Brotula* and *Ogilbia* from shallow water and *Bassozetus* and *Aphyonus* from 1000–2000 fathoms ‖.

In all these cases the cave-dwelling animals, though living in fresh water, are probably descended from forms which have penetrated into the reservoirs of subterranean water by

of the abyssal plankton are sometimes brought to the surface by the strong tidal currents in the neighbourhood of the Canaries (SB. Akad. Wiss. Berlin, 1889, (2) p. 550).

* *Cf.* Chilton, "The Subterranean Crustacea of New Zealand," Trans. Linn. Soc., 2nd ser. Zool. vi. (2) p. 255 (1894).

† Proc. U.S. Nat. Mus. xviii. p. 615 (1896).

‡ Proc. U.S. Nat. Mus. xxvi. p. 430 (1903).

§ Poey, 'Memorias sobre la Historia Natural de la Isla de Cuba. . . .,' ii. (1856–1858) pp. 96 & 102, pls. ix. & x.; and 'Repertorio fisico-natural de la Isla de Cuba,' i. (1865–1866) p. 113; Gill, Proc. Acad. Philadelphia, p. 252 (1863).

‖ See Lane, "The Ovarian Structure of the Blind Fishes *Lucifuga* and *Stygicola*," Biol. Bull. vi. p. 38 (1904).

fissures opening under the sea. In the caves of Lanzarote the communication with the sea is more direct, and, partly perhaps on account of the minimal rainfall, the water is salt. The entrance of marine forms would therefore be comparatively easy, there being no outflow of fresh water from the submarine fissures as is generally the case.

XXXII.—Barbus eutænia *and* B. holotænia, *new Names for* Barbus Kessleri, *Günther* nec *Steindachner*. By G. A. Boulenger, F.R.S.

In accordance with the nomenclature in the British Museum 'Catalogue of Fishes,' I have hitherto designated as *Barbus Kessleri*, Stdr., a little fish common in West Africa, from Cameroon to the Congo. On recently receiving a small collection made by Dr. Ansorge in Angola, I have discovered that a curious inversion of names has taken place in Dr. Günther's 'Catalogue' (vii. p. 107), where specimens from Fluilla, Angola, and "River Ogome" [read Ogowe] are described as *B. Kessleri*, Steindachner, whilst the true *B. Kessleri* is described on the same page as a new species, *B. caudimacula*, from specimens from "Polungo Alto" [read Golungo Alto]. The name *B. caudimacula*, Gthr., is a synonym of *B. Kessleri*, and as no name is available for *B. Kessleri*, Gthr., from Angola, I propose that of *B. eutænia*, in allusion to the sharply defined black lateral band passing through the eye and extending on the caudal fin. In *B. eutænia* the origin of the dorsal fin is a little behind the vertical of the first ventral ray, whilst in *B. Kessleri* the two exactly correspond. Dr. Günther has pointed out in 1896 (Ann. & Mag. Nat. Hist. xvii. p. 277) that specimens from the Ogowe have the barbels longer than those from Angola. As stated in my description in 'Poissons du Bassin du Congo,' p. 225, the posterior barbels are always considerably longer than the eye in the Ogowe-Congo specimens, which differ besides from *B. eutænia* in having the spine of the dorsal fin weaker, sometimes without serration, the origin of the dorsal fin opposite to that of the ventrals, and a black spot at the end of the dorsal fin. I propose the name *Barbus holotænia* for this species.

XXXIII.—*Rhynchotal Notes.*—XXV. By W. L. Distant.

Heteroptera.

Fam. Anthocoridæ.

This paper concludes the revision of Walker's types in the British Museum, so far as the Heteroptera are concerned, and which are contained in the eight volumes of his 'Catalogue of Hemiptera Heteroptera.' This family is treated a little out of its proper sequence in these notes, as I waited to first examine some types contained in continental museums, which I have now done, thanks to the kindness of Dr. Yngve Sjöstedt of Stockholm, Dr. Joanny Martin of Paris, and Prof. Meinert of Copenhagen. The types of the new genera will be figured in vol. iii. of Indian Rhynchota (Blanford series).

Subfam. *Anthocorinæ*.

Ostorodias, gen. nov.

Elongate, subdepressed; head broad, not columnar, about as broad (including eyes) as long; antennæ four-jointed, first joint moderately thickened, not reaching apex of head, second joint thickened, about as long as head, third and fourth shorter, subequal in length and longly setose; rostrum robust, three-jointed, first joint not quite reaching base of head, second joint about as long as first, but more slender, third joint short, about reaching anterior coxæ; eyes subprominent; pronotum with a narrow obsolete anterior collar, with a raised central longitudinal carination, on each side of which the surface is laterally deflected and distinctly foveate, anterior margin about half the width of posterior margin, which is concavely sinuate; scutellum long, subtriangular, with two profound basal foveæ at base; corium with the margins subparallel, the cuneus large and semicircular; membrane with four subparallel veins; tarsi apparently three-jointed, as can be seen from three indifferent specimens; anterior femora broadly thickened, spinose beneath.

Ostorodias contubernalis, sp. n.

Black; corium sordidly stramineous, cuneus pale piceous, membrane smoky hyaline; apices of femora and the whole of the tibiæ and tarsi dull stramineous; head and pronotum obscurely punctate, the last faintly transversely strigose;

scutellum obscurely punctate; hemelytra finely tomentose; other structural characters as in generic diagnosis.

Length 3⅓ mm.

Hab. N.W. Himalayas (*E. P. Stebbing*, Brit. Mus.).

In galleries of the beetle *Polygraphus* sp. in spruce-fir (*Stebbing*).

ARNULPHUS, gen. nov.

Elongate, subdepressed; head somewhat long and slender, longer than breadth including eyes; rostrum three-jointed, first and second joints incrassate, first short, second much the longest, third slender, about reaching the anterior coxæ; antennæ four-jointed, finely hirsute, first joint shortest, second, third, and fourth joints almost subequal in length; pronotum with a wide anterior collar, before which it is also medially constricted, anterior about half the breadth of posterior margin, which is strongly concavely sinuate; scutellum moderately gibbous at base; membrane with three (perhaps four) longitudinal veins; femora moderately incrassated; tarsi two-jointed; cuneus somewhat large and prominent.

Arnulphus aterrimus, sp. n.

Shining black; corium brownish ochraceous, the cuneus black; legs, antennæ, and lateral margins of corium finely hirsute; head, pronotum, and scutellum glabrous; apical area of scutellum transversely strigose; apices of the intermediate and posterior tibiæ and the tarsi stramineous; other structural characters as in generic diagnosis.

Length 4 mm.

Hab. Burma: Karennee.

AMPHIAREUS, gen. nov.

Subelongate, setose; head anteriorly produced, columnar, about as long as breadth including eyes; rostrum three-jointed, first joint very short and thickened, second joint much the longest, third shorter, longer than first and reaching the anterior coxæ; antennæ four-jointed, setose, first joint short, moderately thickened, not reaching apex of head, second joint longest, moderately thickened, third and fourth joints short and slender, subequal in length; pronotum profoundly constricted near middle, anterior area glabrous, posterior area punctate; anterior margin about half the width of posterior margin, which is concavely sinuate; scutellum broad, transversely excavate at base; hemelytra longly pilose, the lateral

margin a little ampliately rounded; membrane apparently with three veins; legs slender; tarsi two-jointed.

Type, *A. fulvescens*, Walk. (*Xylocoris*).

Amphiareus fulvescens.

Xylocoris fulvescens, Walk. Cat. Het. v. p. 160 (1872).
Xylocoris fumipennis, Walk. *loc. cit.*

Hab. Ceylon (*Thwaites*, Brit. Mus.).

LIPPOMANUS, gen. nov.

Subelongate, depressed, hirsute; head about as long as breadth including eyes; rostrum three-jointed, reaching anterior coxæ, first joint not quite reaching base of head, second longest; antennæ hirsute, with the first joint not nearly reaching apex of head, second longest, third and fourth more slender; pronotum somewhat flat, with a transverse constriction near middle, the anterior only about one third the width of posterior margin, which is strongly concavely sinuate; scutellum strongly constricted near middle; corium with the lateral margins somewhat strongly concavely sinuate on basal halves; membrane with four longitudinal veins; femora only moderately incrassate; legs hirsute or finely spinulose; tarsi two-jointed.

Lippomanus hirsutus, sp. n.

Head, pronotum, and scutellum black; head in front of eyes piceous brown; antennæ ochraceous, the first joint piceous; corium ochraceous, with an arched transverse medial fascia crossing apical area of clavus, and the apical area including cuneus fuscous; membrane pale fuscous, the inner and apical margins paler; body beneath piceous, lateral margins of abdomen, the legs and rostrum ochraceous; pronotum, scutellum, and clavus with scattered punctures; corium indistinctly and finely punctate; pronotum with a broad distinct ridge in front of the transverse impression; scutellum transversely ridged at base, foveately depressed on disk; cuneus ill-defined.

Length 3 mm.

Hab. Burma: Karennee (*Fea*); Tenasserim: Thagata (*Fea*).

SESELLIUS, gen. nov.

Elongate, depressed; head a little longer than breadth between eyes; rostrum three-jointed, long, passing anterior

coxæ; antennæ with the first joint considerably thickened and not reaching apex of head, a little longer than breadth between eyes, which are only subprominent; third antennal joint considerably shorter than second; pronotum depressed, with an obsolete narrow anterior collar, transversely excavate on disk, lateral margins moderately sinuate and narrowed anteriorly, posterior margin moderately concavely sinuate; hemelytra with their margins parallel; membrane with a small basal cell and three veins; anterior and posterior femora very strongly incrassated, and spinulose on their under surface; tarsi three-jointed.

Owing to the specimen described being in a carded condition, the structure of the sternum cannot be ascertained.

Type, *S. parallelus*, Motsch. (*Anthocoris*).

Genus Triphleps.

Triphleps tantilus.

Anthocoris tantilus, Motsch. Bull. Soc. Mosc. xxxvi. (3) p. 89 (1863).
Triphleps indicus, Reut. Monogr. Anthocor. pp. 91, 101 (1884).

Summarized Disposition of Walker's Genera and Species belonging to the Family Anthocoridæ.

Species considered valid, but requiring generic revision.

Anthocoris proximus, Walk. Cat. Het. v. p. 151 (1872), belongs to gen. *Oxycarenus*, Fieb. (Lygæidæ).
—— *pubescens*, Walk. *loc. cit.*, belongs to gen. *Oxycarenus*, Fieb. (Lygæidæ).
—— *arctatus*, Walk. *loc. cit.* p. 153, belongs to gen. *Oxycarenus*, Fieb. (Lygæidæ).
Xylocoris fulvescens and *fumipennis*, Walk. *loc. cit.* p. 160, belongs to gen. *Amphiareus*, nov.

Species treated as synonymic.

Anthocoris subcruciatus, Walk. Cat. Het. v. p. 151 (1872), = *Oxycarenus maculatus*, Stål (Lygæidæ).
Xylocoris fumipennis, Walk. *loc. cit.* p. 160, = *Amphiareus fulvescens*, Walk. *loc. cit.*

XXXIV.—*On new Species of Rhopalocera from Sierra Leone.*

By George T. Bethune-Baker, F.L.S., F.Z.S.

Last year Mr. Cator added considerably to his collection of Rhopalocera in the near hinterland of Sierra Leone, both in species and in numbers, and he brought home or sent over to

me many very interesting species, among others that most interesting and rare *Argyrocheila undifera*, Stgr., which, owing to the keenness of observation and enthusiasm of Mrs. Cator (who spent a couple of months with her husband), they were able to take in some numbers. Mr. Cator reports it as one of the most shy species he knows; it is not a strong flier, as we might imagine, but at the very least alarm it drops instantly, and it is almost impossible to find it in the undergrowth, so that, with its uncertain flight, it is by no means easy of capture. There are several new species in the collection which I here describe; my measurement for the expanse of wings is taken by doubling the distance from the centre of the thorax to the apex of the wing. The types are in Mr. Cator's collection.

Acræa Catori, sp. n.

♂. Primaries diaphanous, with the apical area blackish grey for two fifths between the apex and the end of the cell; termen broadly dusky, slightly tapering to the tornus; a broad, dusky, diagonal band from the costal margin of the cell across the angle of vein 2 to near the tornus; a twin dusky spot at the end of the cell, followed by a large twin spot just beyond it; the space between veins 3 and 4 dusky; costa slightly dusky to the cell. Secondaries dull straw-colour, with a very broad dark termen, with the veins and a central stripe in the vein-spaces darker and extending well beyond the dark terminal area, several small black spots at the base. Under surface: primaries with all the pattern showing through, but the apical area and termen tinged with ochreous; the veins and a slight central dash in the vein-spaces dusky. Secondaries brownish ochreous, with two black spots at the base over the cell, two spots near the base in the cell, and two smaller spots on the discocellulars; two spots just outside below the cell at the base, followed by two below them; an oblique row of three spots, the upper one in the angle of vein 2. All the veins are dusky for nearly their whole length, and there is a long, central, dusky stripe between each.

♀. Like the male, both above and below, but larger and the secondaries are rather paler.

Expanse, ♂ 72–73, ♀ 83 mm.

This species will come between *A. epidica*, Obth., and *vesperalis*, Smith.

Euptera Dorothea, sp. n.

♂. Head, thorax, and abdomen extremely dark olive-green,

greyish below; thorax with patagia tipped with creamy yellow, with two anterior spots and two lunular posterior marks of the same colour; abdomen banded above with the same colour. Both wings extremely dark olive-green, so as to look almost blackish with the naked eye, with very pale creamy yellowish markings. In the primaries there is a short dash on the upper margin of the cell at the base, followed by two spots and the outline of a spot at the end of the cell; below these there is an oblique somewhat irregular dash, followed by a broad oblique band ending in a spot above vein 3, the veins show blackish through; above this band are three dashes shaped thus ⟵; a subterminal irregular row of spear-shaped markings, followed by a trace of a very fine line. Secondaries with a subbasal and postmedial broad transverse band, a subterminal row of spear-shaped marks followed by a distinct fine line.

Under surface of both wings ochreous grey. Primaries with a white basal dash on the upper margin of the cell, followed by an ochreous-brown spot encircled with black, and again with white, below which is a small black spot; at the end of the cell is an irregular mark almost encircled with white, a broad whitish oblique band of three large spots, with three whitish dashes, following the upper-side markings; beyond, below vein 2, is a black patch with a series of dark points to near the costa, followed by the subterminal white spear-shaped marks and a fine whitish line as on the upper surface. Secondaries with a basal, medial, and postmedial whitish band, the latter spotted and extending to vein 7; beyond this latter is a series of small, distinct, black spots right across the wing, followed by the subterminal whitish spear-shaped marks and fine whitish line.

♀. Both wings brown, with similar markings to the male, but white, with the addition in both wings of a row of large dark spots before the spear-shaped marks. The under surface is yellower than in the male, with all the markings intensified.

Expanse, ♂ 54, ♀ 59–60 mm.

This insect is probably the West Coast form of *elabontas*, Hew., but it may be recognized by the much broader and larger postmedial band of the primaries, and by the mark in the cell being quite linear; in Hewitson's insect there is a largish cell-spot, above which is a second small one; the two bands in the secondaries are much wider than in *elabontas* and not spotted, and the under surface is uniformly pale.

Pseuderesia moyambina, sp. n.

♂. Both wings brown, primaries with a large postmedial

orange-red patch in the anal angle, fringes tessellated white and brown.

Underside.—Primaries: basal two thirds brownish grey, outer third orange-red, fading into yellowish at the apex and termen and into pale ochreous at the tornus; the costa is grey, irrorated darkly; a broad oblique dark dash is beyond the cell in the orange area, followed by a dark, finer, curved line below the apex; termen black, interrupted in the vein-spaces. Secondaries pale grey, almost entirely covered with diluted vermilion-red, the only grey spaces being below the outer half of the cell, the costa, and the terminal area; a black dot beyond the middle of the costa and a black point at the base below the cell, a large black spot palely encircled above and below the cell and a slightly larger one closing the cell; a postmedial very irregular vermilion-red band finely edged on each side with black, beyond which the terminal grey area is irrorated with black.

Expanse 34 mm.

The species will follow *P. libentina*, Hew., but the upper-side will at once separate it from Hewitson's species, and on the under surface the apical area of the primaries is different.

Pseuderesia Catori, sp. n.

♂. Both wings brownish black, with black fringes slightly interrupted with whitish. Secondaries with a large deep yellow patch below the cell extending to the inner margin into the anal angle. Underside of both wings blackish grey. Primaries with a subapical red-spotted band of five spots, the first and the last being the smallest. Secondaries with the basal area more or less covered with red patches, with three black spots placed in a triangle above and below and closing the cell, that closing the cell being the largest; a sub-marginal, very irregular, interrupted red stripe edged laterally with black, the internal edging being heavy.

Expanse 33 mm.

Two specimens of this insect were taken by Mr. Cator at Moyamba; it will come next to *P. debora*, but the patch on the upperside of the secondaries will distinguish it, whilst on the under surface it has much more pattern generally and very much more red in the basal area.

Liptena diversa, sp. n.

♂. Both wings blackish grey, with a single black spot in each wing at the upper angle of each cell; in the secondaries the costa is narrowly whitish. Underside: both wings whitish, with the cell-spots just mentioned prominently

blackish. The primaries are finely irrorated with brown over the costal half of the wing, very densely in the apical area; a subterminal, narrow, marginal scalloped line, followed by a paler one; termen brown, interrupted finely on the veins: secondaries finely irrorated all over with brown, rather more densely in the apical area; termen finely white, preceded by a brown scalloped line finely interrupted at the veins; below the cell there is a small dark spot.

Expanse, ♂, 27–34 mm.

This species is nearly allied to *ilma*, Hew., but it is much larger, the underside is quite different, the brown irrorations present a marked distinction, and it has none of the very definite dark pattern as in Hewitson's species. My insect flies, moreover, in December, whilst *ilma* flies in April and June. It would be interesting to discover by breeding whether or not this may be the early brood to *ilma*.

Micropentila mabangi, sp. n.

♂. Head, thorax, and upper part of abdomen blackish, abdomen below pale brown; palpi blackish above, cream-coloured below and laterally; legs black, ringed with cream-colour. Primaries blackish brown, with a postmedial, obscure, angled, yellowish stripe: secondaries blackish brown, with a broad, medial, transverse, orange band from the inner margin to below vein 7. Underside: both wings blackish grey, with yellowish stripes and spots: primaries with three cell-spots, the first two almost linear, the third at the end of the cell larger, distinct, and cream-coloured; inner margin cream-coloured, from which a pale orange-yellow, curved, postmedial stripe ascends to the costa, tapering as it ascends and broken at vein 6; a trace of a very fine interrupted spotted submarginal line followed by another distinct line, with a blotch between veins 5 and 6 uniting the two. Secondaries with two basal spots, followed by a series of three, which is again succeeded by two or three spots, that on the costa much larger than the others; up to this spot the costa is broadly scaled with ochre scales; a broad, irregular, postmedial band from the inner margin to the costa, beyond which is a fine line interrupted at the veins, with another very irregular submarginal stripe followed by a fine line of the ground-colour; termen itself finely ochreous.

Expanse 28 mm.

This species is somewhat near *M. Alberta*, Stgr., but is evidently distinct.

Epitolina Catori, sp. n.

♂. Thorax, abdomen, and both wings dark steely blue, with a slight purplish tint. Fringes intersected white and blackish. Underside darkish neutral grey with red markings: primaries with three red transverse dashes in the cell, above the cell thickly irrorated with red, two red costal spots followed by a short red irregular stripe, another small red costal spot, and a terminal double red line enclosing the ground-colour, and so making a row of spots edged with red: secondaries with three basal spots and red irrorations above, followed by two more spots in the cell, with one above and below, that below being a double spot; a postmedial red spotted stripe, with a space between the two costal spots and those below vein 6; a very distinct double, red, terminal line enclosing spots of the ground-colour—this character is most conspicuous in the secondaries.

♀. Both wings brown: primaries with a very broad orange patch, tapering rapidly towards the costa, but not extending up to the costa: underside like the male, but the primaries have the orange patch showing through and extending right across the wing, the grey of the ground-colour is paler, and most of the spots are redder and are rather more accentuated, but the pattern is less distinct.

Expanse, ♂ 31, ♀ 29 mm.

Several specimens were sent home by Mr Cator, and it is a well-marked species.

Phytala leonina.

This species was described by me in this Magazine last year at page 328 (vol. xii.), and I placed it in the genus *Phytala*; but Mr. Cator subsequently brought home more material, enabling me to denude the underside of the scales, and this shows that veins 11 and 12 of the primaries do not actually anastomose, but merely touch each other; the species should therefore be transferred to the genus *Epitola*. Staudinger, however, has already described an *Epitola leonina*, so that my species will require a new name. I therefore propose to call it *Epitola leonensis*.

Epitola Dorothea.

♂. Palpi cream-coloured at base and at the base of the second segment, which is ovate in shape; terminal segment and upper part of second segment brown.

Both wings bright blue. Primaries with the costa to

vein 12 black; a large wedge-shaped black patch closing the cell; vein 1 is slightly swollen for over a third, and for all its length it is devoid of blue scales, especially in the basal and tornal areas, making it stand out prominently; the blue area terminates near the posterior margin very irregularly; the black termen and broad black apex invade the blue on the veins, giving it a strongly dentate margin; fringes finely whitish: secondaries with the costa blackish to vein 6, but with a sparse scattering of fine blue scales above that vein in the apical area; termen narrowly black, the blue area having a definite termination. Under surface: both wings brownish grey, with numerous whitish markings. Primaries with two interrupted lines across the cell and another long and broader one beyond the cell; a postmedial dentate line, a double submarginal line, the inner of the two being scalloped; area below vein 2 white. Secondaries with a slight pale patch at the base, a twin patch across the cell; a small spot above and below the cell nearer the base; a trace of a very interrupted line at the end of the cell, followed by a short interrupted line beyond the end of the cell; a postmedial interrupted curved line all across the wing; a double subterminal line, the inner one strongly scalloped, the outer one less strongly so.

♀. Primaries blackish, with a large white patch over the centre of the wings, tapering rapidly above vein 3, this patch extends from vein 1 to vein 11; the cell and the area between the lower margin and vein 1 are covered sparingly with very fine pale blue scales: secondaries uniform dark brownish grey, with a trace of a few blue scales at the end of the cell. Under surface: primaries with the white patch as on the upperside, only extending to the inner margin, and becoming cream-coloured above vein 4, with the double terminal line as in the male: secondaries as in the male, but with fewer markings.

Expanse, ♂ 44, ♀ 42 mm.

This species is near *cercene*, Hew., but the black patch at the end of the cell and the black and swollen vein 1 will separate it on the upper surface, whilst below my species has many more markings and more white, especially below vein 2.

Epitola sublustris, sp. n.

♂. Primaries dark brown, with a large patch of finer scales of a very deep dark bluish colour occupying about the basal two thirds; this patch has a peculiar lustre, having the tone of dark indigo gone greasy: secondaries bright darkish

blue, with a broad blackish-brown border all round; veins 2, 3, 4 stand out black in the blue area, vein 4 being prominently so to the base. Under surface: both wings greyish brown: primaries with a whitish inner margin, above which is a blackish area to vein 5, with two small whitish spots near its upper outer extremity: secondaries uniform greyish madder-brown, with a distinct trace of a postmedial spotted band, the obscure spots being of the same colour as the ground-colour, but placed in a band slightly paler in colour.

♀. Both wings uniform darkish brown, primaries slightly darker in the cellular area. Underside like the male, but browner; in the primaries the black area is intensified and the two spots more defined.

Expanse, ♂ 34, ♀ 36 mm.

This species is like none that I know of; the peculiar colour of the primaries contrasted with the lustrous colour of the secondaries should render it recognizable at a glance.

Epitola kholifa, sp. n.

♂. Primaries with the costa blackish to the cell, the apical area and termen very broadly blackish, the latter tapering very rapidly below vein 3; the bright blue area is thus restricted in an even curve to the inner marginal three fifths of the wing, being margined by the upper border of the cell, at the end of which is a small black wedge, beyond which the blue extends, tapering off from there to the tornus, the margin being invaded with black at the veins; the lower margin of the cell is much swollen, the vein being covered with brownish scales, thus forming a conspicuous patch, almost reminding one of a Satyrid: secondaries bright blue to well beyond vein 6, with a fine brown termen. The under surface of both wings is greyish madder-brown, fading into greyish towards the termen, with a few irregular, obscure, indefinite markings in the basal and median areas: in the primaries there is a broad, obscure, straight, subterminal, indefinite greyish line; in the secondaries there is a trace of a postmedial grey line, followed by a double subterminal one, the outer of which is fine.

♀. Primaries blackish brown, with a pale blue area as in the male, but more restricted, not filling the cell nor extending nearly to the tornus; beyond the cell are four whitish spots, the second and the fourth from the costa being the largest: in the secondaries the blue area extends only to vein 6 and there is a very broad dark termen. On the under surface both wings are pale greyish brown, with scarcely a trace of

any markings, except that in the primaries the whitish spots beyond the cell show through slightly.

Expanse, ♂ 39–44, ♀ 44 mm.

This species will come next to *leonina*, Stgr., but may be known at once by the male sex-mark, viz. the swollen vein; the blue colour is decidedly brighter, and below there are less markings than in Staudinger's species; the fine postmedial transverse line of the primaries is quite wanting in my insect.

The specimen I have described as the female was observed by Mr. Cator to be flying with the male, the two insects toying together, and he caught them at once with one sweep of the net, though they were not actually "in copula."

Epitola albomaculata.

Mr. Cator has brought home a series of this species, including several females, and as this sex has not been described, it will be well to do so now.

♀. Both wings azure-blue: primaries with costa blackish brown to the cell, beyond which the dark area increases considerably; apical area for a third of the wing blackish brown, in which (area) well beyond the cell there is a white ovate spot between veins 4 and 5; termen broadly blackish brown, increasing suddenly above vein 3: secondaries with costa brown to cell and up to vein 6; termen very broadly brown. Under surface precisely like the male, but with the whitish markings slightly accentuated.

Epitola virginea, sp. n.

♀. Primaries dark brown, with pale azure-blue scales in the cell, at the end of which and beyond is a whitish spot with a few superimposed blue scales; well beyond this is another whitish spot; the inner marginal area is covered for two thirds of its length with similar pale azure scales extending up to the cell and to vein 2, ending in a good-sized whitish spot with a few superimposed blue scales; above it is another smaller white spot: secondaries with the pale azure area confined between veins 1 *b* and 6, and with a very broad brown termen. Under surface: both wings whitish, with brownish-grey marks. Primaries with three irregular spots in the cell with white centres; an extremely serrated and irregular postmedial line, with the serration on vein 4 extended into the submarginal line, and that on vein 2 extended finely along the vein to the termen; the area before this line is whitish, whilst the area on the outside is pure

white ; an interrupted subterminal line, followed by a double scalloped line ; inner marginal area below the cell brownish, followed by a whitish spot, which is bordered by a brownish lunule, beyond which the wing is white to the tornus. Secondaries with three basal spots across the cell and three spots in the middle of the cell ; in each case the central spot is in the cell, and there is one above and one below it ; a long narrow spot closes the cell, which forms the middle of an irregular line ; just beyond this is an irregular postmedial dentate line, followed by a broad whitish irregular band, edged by a subterminal dentate line, beyond which is a row of lunular spots ; the termen is finely brownish, preceded by a fine whitish line, which is edged internally by a fine brownish line. Fringes of both wings whitish, finely intersected at the veins.

Expanse 40–41 mm.

The male of this species has yet to be discovered. It is nearest to *albomaculata*, mihi, but is certainly distinct from that ; the upperside is quite different, whilst on the under surface the spots are decidedly smaller and broken so as not to form striæ, whilst the strongly serrated postmedial lines form a very marked distinction from *albomaculata*.

Deudorix leonina, sp. n.

♂. Primaries blackish, with a large, dark, bright blue patch occupying the basal two fifths of the wings ; at the end of the cell is a very large round spot, which extends into the black termen ; all the veins stand out black ; fringes black : secondaries blackish, the lower half of the cell and the area between veins 1 and 5 blue, with the veins black ; on the termen above vein 5 is a small patch of blue scales ; termen black, with white fringes ; lobe orange-yellow ; tail long, black, tipped with white. Under surface similar to *otræda*, Hew., except that in the primaries there is an indefinite white subterminal stripe between the orange-brown stripe and the termen.

Expanse 30–34 mm.

This species will come next to *otræda*, Hew., but it may be recognized at once by the black spot of the primaries invading the black termen ; in Hewitson's insect this spot is isolated in the midst of the blue area : *leonina* also has a very broad, dark termen, and all the veins stand out black ; in *otræda* this is not the case.

It is probable that this species may stand in collections mixed up with *otræda*, but there is no doubt that they are two species ; both fly in January and also in March.

I have carefully examined the types of both Hewitson's species, *otræda* and *genuba*, and find that Aurivillius was correct in sinking the latter name as a synonym; they are certainly the same insect.

Hypolycæna moyambina, sp. n.

♂. Both wings black; secondaries with a trace of a fine short dash of blue scales in the fold and also in the lobe. Fringes of primaries black, of secondaries white below the apex. Thorax and abdomen with a trace of a few blue scales here and there. Underside of both wings whitish: primaries greyish in the apical and terminal areas; a reddish-brown sex-patch below the cell, an orange-red postmedial stripe edged with brown, a subterminal fine interrupted line edged outwardly with whitish from well below the costa; cell closed with a white dash finely edged with a darkish line. Secondaries with the closing of the cell so fine as to be scarcely discernible; the postmedial stripe broadly orange-red and darkly edged unwaved to vein 1, where there is the **W**-shaped indentation up to the inner margin; a fine dark scalloped subterminal line, outside which is a row of greyish spots; termen black, linear; a velvety-black lobe-spot finely encircled with blue, with a small bright red spot above; between the tail and the outer very short tail, both of which are tipped and fringed with white, is a large black spot edged with orange-red, a distinct whitish space between it and the lobe-spot.

Expanse 28 mm.

Mr. Cator took but one of this very pretty little species, but it is quite distinct from any other of the genus that I know.

Iolaus Catori, sp. n.

♂. Primaries deep lustrous blue, with a slight irroration of paler blue scales in parts near the base and in the cell; costa broadly black; apex black to upper angle of the cell; termen broadly black, rapidly tapering to vein 2, below which to tornus it is linear; a pencil of bluish-black hairs on the inner margin. Secondaries bright darkish lustrous blue, with a large darker central patch in certain lights; the large shining patch extends to the lower margin of the cell, and on the upper margin to the costa is a large patch of differently placed scales, purplish and greenish, with a fine iris of bronzy-green scales; the whole patch appears different colours in different lights; below it,

in the cell, is a dash of purplish iridescence. Under surface: both wings pure white: primaries markless: secondaries with a trace of a very fine subterminal dark line more distinct at the tornus; a bright red terminal spot between veins 2 and 3; the lobe-spot (which on the upperside is black with bright green metallic scales) is small, on the inner margin brilliantly metallic-blue, green, and mauve, edged above with a red lunule, from which is a short, fine, dark line to the inner margin; three tails edged and tipped with white, the upper one on vein 3 being a long tooth.

Expanse 37–38 mm.

This species, though not the brightest, is yet one of the loveliest of a lovely genus: it is quite impossible to describe the blue, and I have not attempted to do so; it shades from every tone of blue that can be imagined into greenish, becoming almost bronze in certain lights, and is brilliantly lustrous in most positions.

XXXV.—*On Three new Species of* Arhopala.

By George T. Bethune-Baker, F.L.S, F.Z.S.

Arhopala halmaheira, sp. n.

♂. Both wings lustrous pale silvery blue, bluer towards the termen. Primaries with a fine black costa, increasing very slightly near the apex; apex rather broadly black for a very limited area, termen narrowly black, fringes blackish: secondaries with costa broadly brown; termen narrowly black; inner margin whitish grey to vein 1 *b*, deepening to dark grey at the tornus; tail black, tipped with white. Under surface: both wings brown, slightly tinged with purple, with darker spots finely encircled with white. Primaries with three increasing cell-spots, that closing the cell large and irregular, below which is a large spot in the angle of vein 2; catenulated band consisting of six spots increasing in size from the costa to the fifth spot, the upper three nearly round, the lower ones irregular; a broad definite submarginal band of uniform width, edged on the interior with whitish; a dark linear termen; area below vein 2 pale up to the submarginal band; fringes grey, darkly tipped. Secondaries with four basal spots, the third shifted outwards and the fourth inwards; three large spots below each other, the middle spot being in the centre of the cell, a large spot closing the

cell, with a smaller one below it in the angle of vein 2; catenulated band consisting of eight spots, the seventh and eighth forming the angled spot and being quite confluent; spots 1 and 2 are shifted inwards, the latter's outer margin barely touching the inner margin of spot 3; spot 1 is smaller than 2 (which latter is large and quadrangular) and is placed on about its centre; spot 3 is shifted right out from 2, 4 slightly further out, 5 and 6 inwards, 7 slightly inwards, confluent with 8, and extending nearly up to the fourth spot of the basal series; a broad submarginal band as in the primaries, but edged on each side with pale greyish white, the slight lobe with a large deep black spot slightly encircled with pale metallic-blue scales; a similar black spot with metallic-blue scales between veins 2 and 3, the marginal space between the two being blackish, more or less covered with pale blue metallic scales.

Expanse 56–57 mm.

The type from Halmaheira is in my collection; it is a marked and very beautiful species, and will come between *A. padus*, Feld., and *elfeta*, Hew.; its much larger size will separate it from the latter, whilst the lustrous silvery pale blue will separate it at once from the violaceous blue of the former, besides which the under-surface pattern is different.

Arhopala sublustris, sp. n.

♀. Both wings sublustrous violaceous blue. Primaries with costa brown, of moderate width, apex broadly brown; termen brown, rapidly decreasing in width to vein 3, whence to the tornus it is quite narrow; an isolated dark spot at the upper angle of the cell somewhat reniform in shape, beyond which four somewhat ovate blackish spots, the second from the costa being the longest, terminate the blue in that area. Secondaries with very broad brown costa; termen less broad and decreasing to the tornus; tail tipped with white. Under surface: both wings clear brown, with darker markings palely encircled. Primaries with three increasing cell-spots, with another small spot above the third on the costa and one below in the angle of vein 2; a postmedial catenulated band of seven confluent spots of nearly even width, the upper four slightly curved, the lower three slightly shifted inwards; a subterminal band palely edged on each side. Secondaries with four very small basal spots, the first shifted outwards, and the third also but to a less extent, followed by three small spots below each other, the second in the cell shifted inwards, the third the largest and irregular; a quadrate spot

closing the cell, below which is a small spot in the angle of vein 2; catenulated band irregular, the first and second spots shifted right inwards, touching the quadrate spot and only just reaching the inner margin of the third spot; third spot shifted right out, fourth further out, fifth inwards, sixth well out, seventh and eighth confluent and shifted right inwards; a submarginal band as in the primaries, with a brown spotted termen; lobe-spot black, edged above with pale metallic-blue scales; a dark spot on each side the tail almost covered with pale metallic-blue scales.

Expanse 37 mm.

The type from Kina Balu (Borneo) is in my collection.

I have received only females of this species at present, but it is a well-marked species and will come next to *sandakani*, B.-B., but can be easily distinguished from it by the much greater area of blue and by the spots at the end of the cell in the primaries, whilst the underside pattern is different also.

Arhopala baluensis, sp. n.

♂. Both wings dark sublustrous blue, with termen black, of moderately narrow width. Under surface darkish brown: primaries paler along the inner margin, with three increasing cell-spots, that closing the cell irregular; below it another in the angle of vein 2, below which is a third shifted inwards on the other side of vein 2; the catenulated postmedial stripe composed of six distinct spots touching one another, that on the costa being quite small and shifted inwards, fifth shifted very slightly inwards, more perceptibly so as to its inner margin, sixth with an outward inclination; the subterminal row is rather obscure. Secondaries with four small basal spots below each other, followed by three larger ones below each other; a quadrate spot closing the cell, with a small elongate one below in the angle of vein 2; the catenulated stripe consisting of six distinct spots, the seventh reniform and the eighth elongate, all touching one another except 1 and 2, each of which is isolated; the fifth spot is shifted very slightly inwards and the seventh reniform spot is also shifted inwards; subterminal row distinct; an anal dark spot covered with dull submetallic blue scales, and a slight trace of them between veins 2 and 3.

♀. Both wings brown: primaries with a paler purplish-blue patch extending just over the upper end and upper part of the cell, but far beyond in the medial area: secondaries with the pale purplish-blue patch extending well into the

median area and having a perfectly even margin all round. Underside like the male, only paler.

Expanse, ♂ ♀, 43 mm.

Hab. Kina Balu (Borneo).

I have two males and one female in my collection. It will follow *agelastus*, but the colour is quite different and also the black termen much narrower, whilst below the distinct spots of the catenulated stripe are a marked character.

XXXVI.—*On Shrews from British East Africa.*

By Oldfield Thomas.

The British Museum contains a number of skins and spirit-specimens of shrews from East Africa which have not hitherto been determined, and which prove nearly all to require description as new. The greater part of them have been presented to the National Collection by Dr. J. W. Gregory, Mr. F. J. Jackson, and Dr. and Mrs. Hinde, while isolated specimens have been contributed by Mr. Betton, Prof. Mackinder, Sir H. H. Johnston, Mr. R. J. Cuninghame, and Mr. R. Meinertzhagen, and to all these collectors our thanks are due for the help they have rendered towards an understanding of this most difficult and intricate group.

The species now dealt with are all true *Crociduræ*, for the *Pachyuræ* in the Museum are too few in number for any opinion to be expressed as to their determination and relationships. Of described species of *Pachyura* the only East-African one is *P. leucura*, Matsch.

The following is a provisional key to the species of *Crocidura* that I recognize in our collection:—

A. Very large. Skull* above 27 mm. *nyansæ.*
B. Smaller. Skull below 25 mm.
 a. Larger. Skull above 20 mm.
 a^1. Tail with numerous long bristles.
 a^2. Tail thick basally, tapering. Colour fawn or brown.
 a^3. Fawn. Fur about 5 mm. in length on back. Skull 23–24 mm. *Hindei.*
 b^3. Brown. Fur very short, about 2·5 mm. on the back *velutina.*
 b^2. Tail more or less cylindrical. Colour grey or smoky.
 a^3. Larger, skull 22–23 mm. Underside of body and tail little lighter than upper *fumosa.*

* From back of condyle to front face of incisors.

b^3. Smaller, skull 21 mm. Underside of body and tail much lighter than upper *Jacksoni.*
b^1. Tail practically without longer bristles, as in *Myosorex.*
a^2. Skull 21 mm. Colour brown..... *maurisca.*
b. Smaller. Skull below 20 mm.
a^1. Brown. Tail over 45 mm.; skull 18·2–19·6 .. *Hildegardeæ.*
b^1. Grey. Tail less than 45 mm.; skull 17·7 *Cuninghamei.*

Crocidura gracilipes, Peters, *C. Fischeri*, Pagenst., *C. nigrofusca*, Matsch., *C. sansibarica*, Neum., and *C. Martiensseni*, Neum., I have not been able to identify.

The following are the descriptions of the new species :—

Crocidura Hindei, sp. n.

Size fairly large. Fur soft and fine; hairs of back about 5 mm. in length. General colour above pale reddish fawn, below dull buffy white, the colour of the under surface mounting rather high up on the sides. Upper surface of hands and feet dull white; fore and hind claws about equal in size, or the latter rather the larger. Lateral gland present, about halfway along the side. Tail very thick at base, rapidly tapering to a point, light brown above, dull whitish below; its long bristle-hairs numerous.

Teeth short and strong; unicuspids well overlapping each other, the two smaller ones broader than long, notched behind.

Dimensions of the type (measured in skin) :—

Head and body (stretched) 95 mm.; tail 50; hind foot (s. u.) 14.

Skull: condylo-incisive length 24·3; greatest breadth 10·3; length of upper tooth-row 10·6; tip of i^1 to tip of p^4 5·3.

A spirit-specimen (♂) has the head and body 79 mm.; tail 59; hind foot 14.

Hab. (of type). Machakos. Alt. 1700 m.

Type. Female. B.M. no. 1. 8. 7. 2. Collected 6 June 1901, and presented by Dr. S. L. Hinde. Two specimens from the type locality, and another, in spirit, obtained by Dr. J. W. Gregory at Karati, Konu Dist., E. Kikuyu.

Crocidura velutina, sp. n.

Size rather less than in *C. Hindei*. Fur close, very short, the hairs on the back only about 2·5–2·7 mm. in length. General colour above brown (rather greyer than "Prout's brown"); below grey (near "olive"), the grey not extending high up on the sides, and passing imperceptibly into the brown of the sides. Upper surface of head and feet dull white;

hind claws rather longer than fore. Tail well provided with bristle-hairs, greyish brown above, little lighter below; its base probably incrassated, though on the dried skin this point cannot be positively ascertained.

Teeth of medium stoutness. Upper unicuspids not very broad, the last one without a notch behind.

Dimensions of the type (measured on the skin):—

Head and body 83 mm.; tail 47; hind foot (s. u.) 14.

Length of upper tooth-row 10·1; i^1 to p^4 5·1.

Hab. Usambara, German East Africa.

Type. B.M. no. 99. 6. 25. 1. Purchased.

This species appears to be related to *C. Hindei* in size and proportions of tail and teeth, but it differs by its browner colour and much shorter fur.

Crocidura fumosa, sp. n.

Size about as in *C. Hindei*, but feet and tail proportionally longer. Fur long and crisp; hairs of back 5·5–6 mm. in length. General colour above dark smoky greyish brown (as dark as "grey No. 3," but markedly browner), darkening nearly to black on the rump. Under surface similar, scarcely paler. Lateral gland small and inconspicuous, its hairs dark brown. Upper surface of hands and feet brown; hind claws longer than fore. Tail rather long, cylindrical, not incrassated at base, well provided with bristle-hairs; uniformly blackish brown above and below.

Skull as in *C. Hindei*, teeth rather lighter, and the unicuspids less overlapping, but there is considerable variation in this respect.

Dimensions of the type (measured in the flesh):—

Head and body 82 mm.; tail 57; hind foot 15; ear 10.

Skull: condylo-incisive length 22; greatest breadth 10; length of upper tooth-row 9·4; i^1 to p^4 4·9.

Dimensions of a specimen in spirit:—

Head and body 71 mm.; tail 50; hind foot 14·2.

Hab. (of type). Western slope of Mt. Kenya, 2600 m. Other specimens from Machakos and Fort Hall (*Hinde*), Nandi and Kakamega (*Jackson*), and Lagari (*Betton*).

Type. Male. B.M. no. 0. 2. 1. 8. Collected 18 September, 1899, by H. J. Mackinder. Four specimens.

This species, which is evidently widely spread in East Africa, is readily recognizable by its dark smoky colour and dark underside. From *C. nigrofusca*, Matsch., it differs by its much shorter tail.

Crocidura Jacksoni, sp. n.

Decidedly smaller than *C. fumosa*. Fur close and fine;

hairs of back about 4·5 mm. in length. General colour above dark smoky grey, indistinctly waved with a silvery lustre, the rump not darker than the back. Under surface "smoke-grey" of Ridgway, markedly lighter than the upper surface. Short hairs of lateral gland whitish. Upperside of hands and feet dull whitish. Tail well haired, with many bristles, dark slaty above, dull white below.

Skull smaller than that of *C. fumosa*, the teeth stout and strong.

Dimensions of the type:—

Head and body (stretched) 73 mm.; tail 51; hind foot (moistened) 13.

Skull: condylo-incisive length 21·1; greatest breadth 9·1; upper tooth-row 9·1; i^1 to p^4 4·7.

Hab. Ravine Station, British E. Africa.

Type. Female. B.M. no. 99. 8. 4. 27. Collected 17 February, 1896, and presented by F. J. Jackson. Four specimens.

This shrew is a smaller edition of *C. fumosa*, of about the same proportions, and with the underside of both body and tail lighter than the upper.

Crocidura maurisca, sp. n.

Size about as in *C. fumosa*. Fur close, crisp, and velvety; hairs of back about 4·8 mm. in length. General colour above dull chocolate-brown (approaching "seal-brown" of Ridgway); under surface but little lighter. Hands and feet dull brown above, the fore and hind claws subequal. A large lateral gland probably present in the male. Tail slender, cylindrical, closely haired, without longer bristles, except that there are two or three at its extreme base.

Skull very light and delicate, the brain-case high in proportion to its breadth.

Teeth small, the upper unicuspids scarcely overlapping; their cingula unusually prominent; anterior muzzle slender. Upper incisors very narrow when viewed from above; small unicuspids longer than broad, oval in section, not notched behind.

Dimensions of the type (measured in spirit before skinning):—

Head and body 75 mm.; tail 60; hind foot 14·4.

Skull: condylo-incisive length 20·7; greatest breadth 9·2; upper tooth-row 9·1; i^1 to p^4 4·8.

Hab. Entebbe, Uganda.

Type. Female. B.M. no. 1. 8. 9. 99. Collected by the late W. G. Doggett and presented by Sir Harry Johnston. One specimen.

This shrew is distinguishable by its dark brown colour,

slender bristleless tail, delicate skull, and small teeth. It is the species of those now described most like *C. gracilipes*, Peters, but that animal is said to have the posterior claws smaller than the anterior ones, and appears to differ in other details.

Crocidura Hildegardeæ, sp. n.

Size comparatively small, form slender and delicate. Fur close and fine; hairs of back about 3·3–3·5 mm. in length. General colour above dull brown (approaching Prout's brown), rather greyer and lighter below. Upper surface of hands and feet pale brown. Lateral gland small, its hairs dull whitish. Tail slender, cylindrical, well provided with bristle-hairs, its colour brown above, rather paler below.

Skull of normal proportions. Teeth very light and delicate; main cusp of anterior incisor slender.

Dimensions of the type (measured in skin) :—

Head and body (stretched) 78 mm.; tail 50; hind foot 12·5.

Skull: condylo-incisive length 19·6; greatest breadth 9; upper tooth-row 8; i^1 to p^4 4·1.

Two spirit-specimens (male and female) measure :—

Head and body 62 and 61 mm.; tail 49 and 47; hind foot 12·7 and 12·4.

Hab. Fort Hall, Kenya District. Alt. 1300 m.

Type. Probably male. B.M. no. 3. 2. 27. Original number 118. Collected 23 October, 1902, and presented by Dr. S. L. Hinde. One skin, besides two spirit-specimens obtained and presented by R. Meinertzhagen, Esq.

The small size and brown colour of this shrew will distinguish it from any species hitherto described.

The species is named in honour of Mrs. Hinde, the actual collector of a large proportion of the specimens presented in her husband's name.

Crocidura Cuninghamei, sp. n.

Size very small. Fur fine and velvety; hairs of back about 2·8 mm. in length. General colour above dark slaty grey, a rather browner tone on the posterior back. Undersurface pale drab-grey, not sharply defined. Upper surface of hands and feet dull whitish; fore and hind claws subequal. Lateral gland fairly large, its hairs grey. Tail rather long, well provided with bristle-hairs, which are black basally and white terminally; its ground-colour brown above, dull whitish below.

Skull smaller than in any of the previous species, though nevertheless larger than in the little Somali *C. Bottegi*, Thos.

Teeth not specially small, the unicuspids well overlapping, the posterior ones notched behind.

Dimensions of the type (measured in the flesh) :—

Head and body 60 mm.; tail 40; hind foot 11.

Skull: condylo-incisive length 17·7; greatest breadth 7·7; upper molar series 7·6; i^1 to p^4 3·7.

Hab. (of type). "Small uninhabited island one mile north of Sajitu Island, Victoria Nyanza." Another specimen from Kama Island.

Type. Female. B.M. no. 2. 7. 5. 6. Collected 29 December, 1901, and presented by R. J. Cuninghame, Esq.

This little shrew, which Mr. Cuninghame found on two islets in the Victoria Nyanza, is the smallest yet described from East Africa; but it is possible that allies of the still smaller species *C. nana*, Dobs., and *C. Bottegi*, Thos., will prove to occur there, even if there are no representatives of the pigmy shrews of the *C. madagascariensis* group.

BIBLIOGRAPHICAL NOTICES.

A Natural History of the British Lepidoptera. A Textbook for Students and Collectors. By J. W. Tutt, F.E.S. Vol. IV. With Synopsis of Contents of, and General Index to, Vols. I.–IV. Sonnenschein: April, 1904. Pp. xvii, 535. Portrait and pls. i., ii.

Another two years have passed since the publication of vol. iii. of Mr. Tutt's *magnum opus*, and we have again the pleasure of calling the attention of entomologists to the appearance of a fresh volume of the series. Five species of Sphingides were discussed in the latter part of vol. iii., and vol. iv. is devoted entirely to the twelve remaining species, supplementary notes, and a Catalogue of Palæarctic Sphingides. The Preface deals chiefly with questions of nomenclature, into which we cannot here enter; but we may note that, except as regards the two species of *Hemaris*, Mr. Tutt makes every one of our British species the type of a distinct genus; and in most cases he is certainly justified in this, though it was naturally unnecessary so long as little or nothing was known of the allied foreign species. But we do not see why Mr. Tutt should ignore Scopoli's genus *Macroglossum* (only quoting Ochsenheimer's late form, *Macroglossa*) and give *stellatarum* as the type of *Sesia*, Fabr., from which, we hold, Scopoli's action practically removed it. We cannot follow his reasoning in vol. iii. p. 344 and note. The long account of the habits of this well-known species (the Humming-bird Hawk-Moth) in vol. iv. is very interesting. Much information is also given about the hybrids between *Celerio gallii* and *Hyles euphorbiæ* (we do not, however, see why the *laps. cal.* of *gallii* for *galii* need be retained).

The history of the occurrence of the rarer Sphinges in Britain, as summarized by Mr. Tutt, is also of considerable importance, as well as the remarks on the structure and colours of larvæ and the stridulation bee-persecuting habits of *Manduca atropos*. The two plates relate to the last-named species in its various stages. The volume closes with an index, synopsis of contents of vols. i.–iv., and general index to vols. i.–iv., the last item by the Rev. George Wheeler.

In conclusion, we can only again emphasize our conviction of the enormous value of this encyclopædic work to all working Lepidopterists. W. F. Kirby.

The Fauna of British India, including Ceylon and Burma. Published under the authority of the Secretary of State for India in Council. Edited by W. T. Blanford.—*Rhynchota.* Vol. II. (*Heteroptera*). By W. L. Distant. London, 1904. 8vo. Pp. xvii, 503; figs. 319.

The second volume of Mr. Distant's important work on the Bugs of India extends from Fam. 4. Lygæidæ to Fam. 16. Capsidæ, thus, with the exception of the Anthocoridæ, completing the monograph of the true Land Bugs of India. The remaining Heteroptera will be included, with the commencement of the Homoptera, in the third volume; and we hope that the Homoptera will be treated in the same exhaustive manner as the Heteroptera. The total number of Heteroptera described in Mr. Distant's first two volumes is 1471, while the whole number of British species is upwards of 450. Nevertheless certain families of Land Bugs are apparently more richly represented in Britain than in India. Thus, Mr. Distant describes only three species of Indian Saldidæ, only one of which belongs to the genus *Salda*, Fabr., whereas Mr. Saunders describes 17 British species, all belonging to the genus *Salda*. Then there seem to be only two Indian species of Cimicidæ, including the notorious *Cimex lectularius*; whereas we have 4 species in Britain, including the insect already mentioned, which is certainly a naturalized and not a native species with us.

We should like to see a series of works similar to the 'Fauna of British India' undertaken with respect to all the principal British possessions.

PROCEEDINGS OF LEARNED SOCIETIES.

GEOLOGICAL SOCIETY.

June 8th, 1904.—J. E. Marr, Sc.D., F.R.S., President, in the Chair.

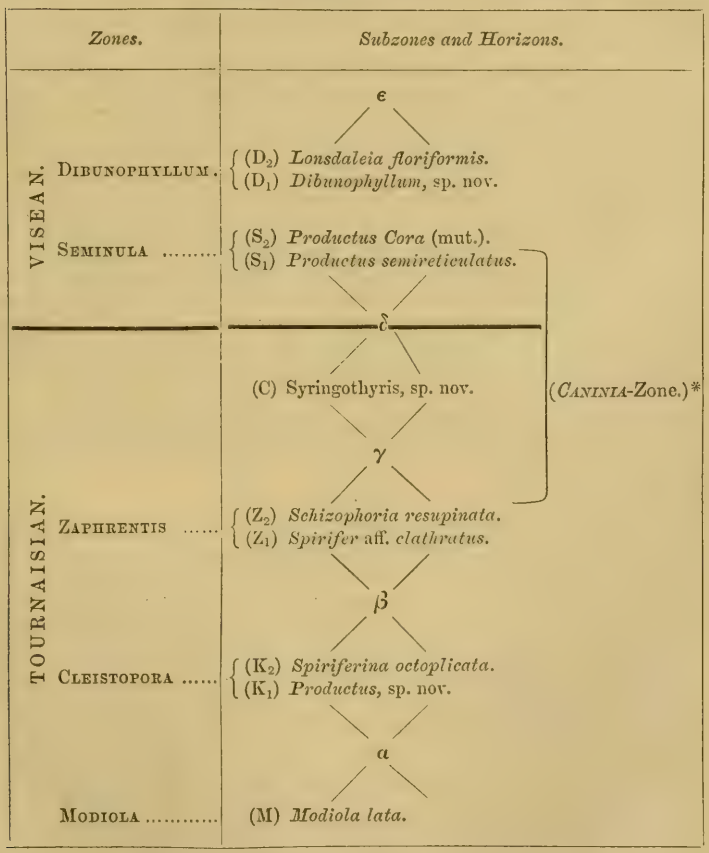
The following communications were read:—

1. 'The Palæontological Sequence in the Carboniferous Limestone of the Bristol Area.' By Arthur Vaughan, Esq., B.A., B.Sc., F.G.S.

The zonary divisions established by the Author are given in the table on p. 239 in the form in which they are finally set out, after emendation and further revision of a preliminary working system.

For several reasons the Author chooses the corals and brachiopods as zone and sub-zone fossils, and he has selected genera for zone-indices and circuli (or species-groups) for sub-zonal indices. A circulus is defined as an aggregate of all the species which possess, in common, a large number of essential properties, and are the results of similar chains of evolution. To secure definiteness photographic figures are introduced, not only to illustrate new specific names, but to convey the precise sense in which well-known specific names are employed in the paper. The relative acceleration of the two groups employed is not identical in different localities, and there is a small relative displacement of one group upon the other, even within the area considered by the paper. The strata in which the indices of two successive zones are found to overlap one another are referred to as 'horizon α, β, γ,' etc.

The detailed stratigraphical portion of the paper deals with all



* Employed throughout the preliminary working system.

the important sections and isolated exposures in the Bristol area :— The Avon section, the Sodbury section, the Farland area, the Tytherington section, the Clevedon and Portishead area, isolated exposures, and the Backwell-Wrington mass. In each case there is given (1) a description of the position at which each zone or sub-zone is exposed and of its lithology ; (2) a list of the corals and brachiopods found in the zone or sub-zone, with notes on their abundance ; (3) a comparison with the same horizon in other parts of the Bristol area, and notes on the peculiarities of the section under discussion. In dealing with the Avon section an analysis is given of Stoddart's paper, and reference is made to his collection. The details of this portion of the paper are next summed up in tables and discussions of the ranges and maxima of the corals and brachiopods within the Bristol area. This is followed by a comparison of the last-named area with that of the Mendips, resulting in the conclusion that, when allowance is made for small variations (which are tabulated), the palæontological sequence agrees remarkably in the two areas.

The Author next gives a summary of M. Lohest's discussion of the parallelism of the Belgian sequence with that of the Avon section, and adopts the Belgian divisions of Tournaisian and Viséan for the lower and upper parts of the Carboniferous Limestone. A comparison is also instituted with M. Mourlon's grouping, and it is remarked that the brachiopods mentioned by M. Mourlon and Prof. Dewalque occur in the same order in the Bristol area as in Belgium, and are correspondingly characteristic of the beds. The Author claims that in the area with which he deals, his table of ranges is sufficient to enable any worker to zone any exposure with a considerable degree of accuracy. In conclusion, notes are given on all the important species and circuli dealt with ; and descriptions of a number of new species, circuli, and mutations.

2. 'On a small *Plesiosaurus*-Skeleton from the White Lias of Westbury-on-Severn.' By Wintour Frederick Gwinnell, Esq., F.G.S.

The remains described were found on the beach, and had evidently recently fallen from the cliff above, which is made up of the Upper Rhætic Beds, including the *Estheria*-Bed and the White Lias Limestone. The matrix of the specimen corresponds with the White Lias in colour, texture, and material, and it is similarly traversed by fissures often coated with dendrites. The remains include more than twenty small dorsal vertebræ, with spinous and transverse processes, lying in natural sequence. A pseudomorph of the spinal cord in calcite occurs also in position. Several slender ribs, and indications of other bones probably from the pectoral or pelvic arches, also occur in the slab, but are not yet worked out. Hitherto only single vertebræ or fragmentary bones of *Plesiosaurus* have been recorded from this horizon in Britain. At present, it has not been found possible to assign the fossil to any existing species.

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[SEVENTH SERIES.]

No. 82. OCTOBER 1904.

XXXVII. — *Observations on Coleoptera of the Family* Buprestidæ, *with Descriptions of new Species.* By Chas. O. Waterhouse, F.E.S.

While incorporating the valuable collection of Buprestidæ recently acquired by the British Museum from Capt. Ch. Kerremans many facts have come under my notice which, I think, will be of interest to those studying this family, and which I therefore here record. I have also described several species which appear to be new.

Buprestidæ.

Sternocera æquisignata and *aurosignata.*

These two species (the former from Siam, the latter from India) are very difficult to distinguish from above, but are easily recognized from below by the position of the triangular, finely punctured, and generally pubescent spots on the last segment of the abdomen; *S. æquisignata* has these spots close to the margin, *S. aurosignata* has them removed from the margin.

S. sternicornis is usually easily known by the numerous white pubescent spots on the elytra. The underside of the abdomen is rather closely marked with large, shallow, finely

punctured and pubescent spots, but there are no triangular patches on the last segment as in *æquisignata* and *aurosignata*.

Sternocera sternicornis, var. *linearis*, Kerr.

This species has no spots on the elytra, but the underside of the abdomen agrees with *sternicornis*.

Sternocera multipunctata, Saund.

Cochin China. This species has numerous white spots on the elytra, as in *sternicornis*; but it has the abdomen almost as smooth as in *æquisignata*, and it has the triangular spots at the *side* of the last segment as in *æquisignata*. I have seen only two specimens of this insect.

Sternocera punctatofoveata, Saund.

Siam. This species has the form and punctuation above of *æquisignata*, but there are traces of lines of spots on the elytra. The abdomen is smooth and has the triangular spots on the last segment at the sides, as in *æquisignata*. A specimen from Capt. Kerremans' collection has the spots rather more distinct than in the type.

Sternocera ruficornis, Saund.

Siam. This species resembles *aurosignata*, but is shorter and more regularly ovate. It is of a rich steel-blue, with reddish antennæ and legs. The abdomen is very shining, bright green, with the sutures marked by copper. The triangular pubescent spots on the last segment are very large, almost meeting in the middle of the segment, of a reddish-golden colour. The pubescence on the two preceding segments is much more extended than is usual in *aurosignata*.

I have seen only the type specimen.

In Capt. Kerremans' collection there are two specimens labelled *ruficornis*, but they are very unlike the type specimen of that species. They are of a bright golden-green colour, and the elytra are sculptured nearly as in *sternicornis*. The thorax has the sides very slightly rounded, almost rectilinear, and it is much narrowed in front; the elytra are very acuminate. The underside agrees very well with *ruficornis*. The legs are of a reddish colour.

Sternocera Kerremansi, Kerr.

Siam. This species is of a bright green colour and is certainly the same as the two specimens just referred to above, differing only in having traces of pubescent foveæ on the elytra.

These three specimens may prove to be extreme forms of *ruficornis*, but I have not seen specimens intermediate between them and the typical *ruficornis*.

The colour of the underside and the non-metallic legs suggest affinity with *S. dasypleura* rather than with *S. æquisignata*.

Sternocera Druryi, sp. n.

Statura *S. castaneæ*, nigra, nitida; antennis, elytris pedibusque castaneo-flavis.
Long. 22 lin.

Hab. Upper Nile (*W. B. Drury, R.N.*); Gadarif, Sudan (*Dr. Hayes*).

This species is close to *S. castanea*, but differs in having antennæ, legs, and elytra (especially the elytra) much more yellow. The thorax and underside are jet-black, not the least bronzy. The thorax strongly sculptured with elongate foveæ and confluent rugæ, as in *castanea*, but there is much less pubescence in the foveæ. The elytra are without pubescent spots, except the one at the base, which is very inconspicuous. The legs are brownish yellow, with the posterior margin of the femora black.

A specimen of this species without locality has been in the Museum for many years associated with *S. castanea*. Recently a specimen was received from the Upper Nile, and there are two fine specimens from Sudan in the Oxford Museum.

Sternocera Stevensii, sp. n.

Resembles and is closely allied to *S. interrupta*, but differs in the sculpture and ornamentation of the abdomen.

Head and thorax black, with numerous moderately strong punctures and a median impressed line, all filled with whitish pubescence, as in *interrupta*. Elytra castaneous, rather more strongly punctured than in *interrupta*. Each elytron with a small dirty white spot near the scutellum, an elongate spot in the middle of the base, a longer one below the shoulder, and a line behind the middle (near the side).

Body beneath dark æneous. The abdomen is marked with punctures, each puncture bearing an obscurely brassy hair. These punctures are placed in groups of two or three or in undulating lines at the sides of the segments. On the third and fourth segments these punctures are crowded together so as to form an undulating band, leaving a smooth shining spot on each side at the base, and a wide, triangular, sparingly punctured area in the middle. The punctures on the apical segment are crowded together so as to form triangular patches on each side, leaving the middle space sparingly punctured.

Long. 17 lin.

Hab. W. Africa.

Variety A.—Elytra dark castaneous, nearly black.

Hab. N. Nigeria (*Capt. Lelean*).

Variety B.—Thorax brassy. Elytra very dark brown, with blue reflections.

Hab. Damara Land.

Sternocera Zechiana, Kolbe.

Sternocera Zechiana, Kolbe, Ent. Nacht. xxiii. 1897, p. 351.

In the Museum there are several specimens from Togo and Upper Niger which appear to be referable to this species. The dark spot described on the shoulder of the elytra is, however, so very indistinct, and, on the other hand, the pubescent spots on the abdomen, described as "flavido-tomentosa indistincta," are so very well marked, that it is just possible they may be a different species. The thorax is dark bluish æneous, with golden punctures. The elytra are brown, with the suture and margin very narrowly margined with brassy black. The underside of the insect is bright golden æneous, with blue or copper tints on the abdomen. One example is dark bluish beneath. The abdomen is moderately strongly punctured, each puncture bearing one, two, or three yellow hairs: these are arranged in a line along the apical margin; others are placed irregularly not very close together in the middle of the segment, but at the base on each side they are fine and crowded together so as to form very wide triangular patches on the third and fourth segments. The apical segment has two equilateral triangular patches of yellow pubescence.

The chief differences between this species and *S. Stevensii* are that this has no pubescent spots on the elytra; and the pubescence on the abdomen, which in *Stevensii* covers the greater part of the sides of the segments, extending to the

posterior margin (but leaving a *bare spot* at the basal margin), in this species is more confined to the basal part of the segment and leaves no bare spot at the base.

This species forms an interesting passage from *S. Stevensii* to *S. Colmanti*, Kerr. In this latter, which is of a brassy colour above as well as below, the abdomen has the pubescence arranged nearly as in *Stevensii*, but it is much less dense and the pubescent spots are very vague.

In *S. Duvivieri*, Kerr., which has the underside coloured much as in *S. Zechiana*, the pubescence on the abdomen is longer, more sparse, and does not form spots at all. The elytra in some specimens show *very* slight traces of the elongate spots as in the *interrupta* group.

S. mephisto, a smooth shining insect, has the pubescence on the abdomen as in *S. Stevensii*—*i. e.*, with four smooth spots surrounded by fine pubescence on the third and fourth segments.

Acherusa Saundersii, sp. n.

Very dark cyaneous, with the sides of the thorax and the whole underside clothed with ashy pubescence. Elytra with the basal area coppery, with purple and brassy shades; this colour is extended posteriorly more on the fifth, sixth, and seventh interstices.

Long. 10 mm.

Hab. Brazil.

This species presents nothing unusual in its form. It is close to *A. piliventris*, Saund., but differs in the granulation of the thorax and in the colour of the elytra. The thorax is dark steel-blue. The punctuation is distinct and not very fine, the punctures separated from each other by about two diameters of a puncture. On the disk the punctures are replaced by round distinctly raised granules. In *A. piliventris* the punctuation is much finer, slightly asperate, and there is an indication of transverse striolation. The elytra are as in *A. piliventris* (not impressed at the apex as in *A. Childrenii* and *Parryi*), and the third, fourth, and fifth costæ remain parallel as in *A. piliventris* (not turned towards the side as in *A. Childrenii* and *Parryi*). The coppery colour occupies all the basal area, but extends posteriorly more towards the sides, especially on the fifth, sixth, and seventh costæ.

Paracastalia longipennis, sp. n.

Dark cyaneous, with green tint. Thorax strongly and

very closely punctured. Elytra reddish brown, with cyaneous tint on the costæ.

Long. 14 mm.

Hab. Nyassa (*Thelwall*).

Very close to *P. plagiata*, Kerr., but narrower. Thorax strongly and densely punctured, the punctures less close on the disk. The lateral carina (viewed from the side) with an arcuate sinus at the base, then continued straight to the anterior sternal notch, rendered crenulate by the coarse punctuation, and obliterated anteriorly. In *P. plagiata* this carina is bisinuate or undulating and is smooth. Elytra uniform reddish brown, each with four strong costæ, the first of which extends to only half the length of the elytra. The apex acutely denticulate.

At first I thought this might be only a colour variety of *P. plagiata*, but the lateral carina of the thorax is so different that I think it must be a distinct species.

Paracastalia Duvivieri, Kerr.

The type specimen of this species has several very small pale yellow spots on the elytra. In the British Museum collection there are two specimens, one from Nyassa, the other from Zambesi, which differ from the type in having somewhat large orange-yellow spots, arranged thus :—a large spot surrounding the humeral callus, one near the suture before the middle, a very small one on the margin below the shoulder, a quadrangular transverse spot about the middle, an undulating fascia a short distance from the apex, and a small spot at the apex.

Neither of these specimens has the median line on the throat so marked as in the type. They may be a distinct species, but the material at disposal does not at present justify their separation.

Paracastalia Bettoni, sp. n.

Elongate, parallel, dark bluish æneous. Elytra dull red, each with nine or ten nearly equally raised convex costæ, the first of which extends only to the middle.

Long. 14 mm.

Hab. Samburu, Brit. E. Africa (*C. Steuart Betton*).

The species of this genus hitherto described are peculiar for the fact that each elytron has four well-marked costæ separated by channels. The first and second channels unite at the middle, behind the first costa, and from this point to the apex there is a single costa. In *P. Bettoni* all these

channels are represented by costæ, so that each elytron has eight or nine dorsal costæ (the first abbreviated), separated by lines of transverse punctures, the costæ themselves finely punctured. The thorax has a slight indication of a dorsal channel in front and at the base. The punctuation on the disk is not very strong and the punctures are slightly separated, but towards the sides they are stronger and close together.

A species of the Heteromerous genus *Praogena* received with this species has similar coloration.

Paracastalia variegata, sp. n.

Elongate, blackish æneous; the elytra with a number of small, irregular, reddish-yellow spots.

Long. 16 mm.

Hab. Port Natal.

Thorax very slightly broader than the elytra, somewhat narrowed in front, arcuately rounded at the sides, strongly and very densely punctured, somewhat rugose. The disk lightly impressed, with a slight median impressed line at the base. Slightly pubescent, with obscure yellow spots; a double spot on the disk, with a minute one in front; a very small one between the central one and the side, and two rather larger ones on the side, one near the front angle, the other at the middle. The elytra are very long. The first costa (after the suture) is short, stopping considerably before the middle; the second is scarcely convex, except posteriorly; the third is cariniform; the fourth scarcely convex; the fifth and seventh convex and distinct; the sixth only slightly convex. Each elytron has a large number of yellow spots, five of which form a small band at a short distance from the apex. The apex arcuate, with numerous acute equal teeth. The underside of the insect is clothed with short greyish pubescence. The sternal process is more acute than in allied species. The lateral ridge of the thorax is only represented by a slight sinus at the base.

The costation of the elytra in this species is intermediate between *Duvivieri* &c. and *Bettoni,* but the lateral expansion of the elytra is rather less strong. It differs from all the other species in being pubescent below.

Castalia.

There has been much confusion in this genus owing to the differences in the sexes; and it is regrettable, after these differences had been pointed out by Dr. Heller (Deutsch. ent. Zeit. 1891, p. 135) to be sexual, that Capt. Kerremans

has again confused them. I have examined Capt. Kerremans' examples, and he has fallen into an error in supposing that he had both sexes with acuminate apex to the abdomen. The synonymy as given by Dr. Heller is quite correct, except that *C. auromaculata*, Saund., is quite distinct from *bimaculata*, L., and I think *C. cyanipennis* is also a distinct species.

Castalia pulchra, sp. n.

Somewhat the build of *C. bimaculata*, L., but relatively shorter and broader, of a beautiful violet-blue. Thorax very broad, strongly punctured, the punctures on the disk crowded together, not quite so close at the sides; the sides much rounded, widest near the base, slightly tinted with green. Basal fovea very deep. Elytra much shorter than in *C. bimaculata*, dark violet-blue, a little paler at the apex, tinted with green at the basal margin; with an obscure, oblique, reddish-yellow, ill-defined spot behind the middle; strongly and very densely punctured; each elytron with four well-marked smooth costæ, the first only reaching to the middle. The apex denticulate. Lateral carina of the thorax (viewed from the side) slightly bisinuous, the surface within this carina not so deeply impressed as in *C. bimaculata*. Abdomen dark steel-blue, shining, the segments bordered with violet; very strongly punctured, the punctures generally separated from each other by less than a diameter of a puncture, but at the sides they are closer and touch each other.

Long. 18 mm.

Hab. India.

Castalia auromaculata, Saund.

The type of this species is a much shorter insect than *C. bimaculata*; the thorax is shaded with violet on the disk, with golden and copper at the sides. The under flanks of thorax and sides of the basal segment of the abdomen are purple-coppery. The abdomen is somewhat golden, with the segments bordered with steel-blue. The elytra are dark green, with the costæ somewhat brighter; the intervals with punctures, which are not very close together and are arranged in lines.

The type is a female.

A male example from Capt. Kerremans' collection, labelled "Tonkin, Fairmaire," agrees exactly in form and sculpture with the type; but the colours of the thorax are more obscure and the elytra dark violet.

Castalia Fairmairei, sp. n.

Very similar to *C. auromaculata*, but more elongate. Bluish green, with slight brassy tint. Thorax convex, densely punctured as in *auromaculata*, the punctures at the sides very slightly separated. The sides rather strongly rounded. The disk tinted with blue; the sides with brassy. Elytra rather strongly, closely, and irregularly punctured, the punctures not forming lines. Body beneath brassy, the under flanks of the thorax and base of abdomen tinted with coppery.

Long. 21 mm.

Hab. Tonkin (*coll. Kerremans*, ex *Fairmaire*).

I have been in much doubt as to this insect being distinct from *C. auromaculata*. There were four examples in Capt. Kerremans' collection, all labelled "Tonkin, Fairmaire," one male and three females. The male differs from the females in being shorter; it has the thorax almost parallel at the sides behind the middle. The elytra are comparatively sparingly punctured and the punctures are in lines. In these respects it agrees exactly with the type of *auromaculata*. The females, to which I have now given the name *C. Fairmairei*, are much longer, have the sides of the thorax strongly rounded and the elytra densely and irregularly punctured.

I at first thought that these differences might be sexual, but the dissection of the type of *auromaculata* proved it unquestionably to be a female. Under these circumstances I have placed the male from Tonkin with *auromaculata*, and regard the three females from Tonkin as those of a distinct species.

Castalia Bettoni, sp n.

General form of *C. bimaculata*, L., but a little broader. Head, thorax, and body beneath æneous; elytra obscure violet, with an indistinct ferruginous spot near the side before the middle. Thorax very broad, moderately strongly punctured, the punctures more sharply defined than in *bimaculata*, separated from each other on the disk by about the diameter of a puncture, a little closer together at the posterior angles; at the front angles (where the surface is slightly impressed and brassy) the punctures are finer and crowded together. The disk has an impressed Y-shaped mark. The punctuation of the elytra is very distinct. In the intervals between the costæ the punctures are generally slightly separated from each other, but at the apex and sides they are more crowded together. [The specimen described

has the second costa furcate at the apex, but this is probably an individual character.] The abdomen is moderately strongly punctured, the punctures not crowded; æneous, with coppery shade, the extreme margins of the segments steel-blue. The femora are dark bluish green; the tibiæ violet.

Long. 21 lin.

Hab. Samburu, Brit. E. Africa (*C. Steuart Betton*).

Polycesta.

By the kindness of M. Oberthür I have been able to examine all the types of Gory, Thomson, &c. in his collection. Unfortunately some of the labels had manifestly been put on the wrong specimens before they came into M. Oberthür's possession. I hope the following notes will be useful in elucidating the synonymy, but until more specimens from exact localities are available much doubt must still attach to the names of several species.

Polycesta cyanipes, Fabr.

The type of this species is in the Hunterian Collection in the University of Glasgow. It is *P. resplendens*, Th., from Jamaica. Specimens labelled *cyanipes*, F., from Capt. Kerremans' collection are the true *depressa*, Linn.

Polycesta costata, Sol.

Polycesta costata, Sol., Gay's Hist. Chile, iv. p. 491 (1854).

Mr. Saunders, in his Catalogue, places this next to *carnifex*. Capt. Kerremans does not mention it. From description it appears to me to be an unspotted variety of *carnifex*. If this surmise is correct the name *costata* will have priority.

Polycesta porcata, Fabr.

The species for which this name is being retained in the Museum is one of the broadest species of the genus, brownish coppery, with dark green tint on the costæ, with most coarsely pitted elytra. Apparently common in St. Domingo.

Polycesta thomæ, Chevr.

The type of this species is in the Museum. It resembles the preceding, but the punctures or pits on the elytra are rather smaller, rather more regular, and consequently the costæ are more evident.

It is not the same as *P. Goryi*, Saund., as given by Capt. Kerremans in Wytsman's 'Genera.'

Polycesta depressa, Linn.

The type of this species is in the Linnean collection at the Linnean Society of London. The thorax is dark metallic green shaded with coppery, very acutely angulated at the sides behind the middle, the disk with a large, shallow, strongly punctured impression. The elytra are brownish coppery, with the sutural area and lateral costæ green and shining.

Polycesta karakara, Chevr.

The type of this species is in the Museum. Mr. Saunders in his Catalogue considered this a variety of *depressa,* but I am inclined to give it specific rank. It is a much more brilliant insect, more elongate, with the elytra more acuminate; the punctuation of the elytra is coarser and rather less regular.

Polycesta porcata, Lap., nec Fabr.

This species is described from Guadaloupe. The figure represents it as a brightly coloured insect; the abdomen is said to be blue.

In M. Oberthür's collection there is a specimen labelled Guadaloupe from Laporte's collection which has the abdomen bright blue. It is the only specimen that I have ever seen with a blue abdomen, and I suggest that it is almost certainly the specimen described by Laporte as *porcata.* It is a colour variety of *karakara.* The specimens in M. Oberthür's collection labelled *P. porcata,* L. & G., type, are, from the locality-labels and description, evidently not the species described by Laporte; they are *P. depressa,* L.

Polycesta depressa, Oliv., nec Linn. = *Olivieri,* n. n.

This species is said to be in the British Museum, and there is in the Museum a very old specimen bearing the name *depressa* which I believe is certainly that mentioned by Olivier. It is a broad insect, very flat dorsally, of a somewhat dull brownish coppery, with obscure green in parts. It has all the costæ of the elytra well marked, *i. e.* each elytron has six dorsal costæ, the second and fourth only slightly more elevated than the others.

The old specimens in the Museum are without locality, but recent examples in the Museum and in M. Oberthür's collection are from Jamaica.

Polycesta depressa, L. & G., nec Linn.

Mr. Saunders in his Catalogue proposed the name *Goryi* for this species.

The specimen marked "*cribrata*, Th., type" in M. Oberthür's collection, are the same species; *P. Goryi* has priority.

Polycesta alternans, sp. n.

Elongate, slightly and evenly convex; purple-coppery, with green intermixed. Thorax broader than the elytra, somewhat flattened dorsally, broadest behind the middle, obliquely narrowed in front; strongly punctured, the punctures slightly separated on the disk, crowded at the sides, with a smooth median line: base with a transverse, dull black, smooth band; basal fovea distinct, but not large. Elytra with the costæ subequal, alternately green and coppery, the first extending only to the middle, the third and fifth only slightly more prominent than the others; the intervals rather strongly, closely, and irregularly punctured, especially at the sides and apex; near the scutellum the punctures are finer and less close. Tibiæ and tarsi blackish. Underside coppery, with green intermixed, the green forming a narrow band near the posterior margins of second, third, and fourth segments, the margins themselves black. Prosternum finely punctured, the punctures not close together. The middle of the basal segment of the abdomen is similarly punctured, but the punctures are rather stronger and a little closer on the following segments, and the apical segment is closely punctured; the punctuation at the sides is fine and very dense.

Long. 26 mm.

Hab. Pinos Altos, Chihuahua, Mexico (*Buchan-Hepburn*).

A single example from Messrs. Godman and Salvin's collection, received too late for inclusion in the 'Biologia.'

The nearest allied species in the Museum is named *cribrana*, Mots., which must not be confounded with *cribrata*, Mots.

Polycesta regularis, sp. n.

Oblong, parallel, much flattened, only a little more than twice as long as broad, nearly black, but with a slight cyaneous tint below. Elytra ferruginous. Thorax not quite twice as broad as long, black, dull, broadest behind the middle, strongly angular at the sides, obliquely narrowed in front and behind; the space from the lateral angle to the

base rectilinear. The punctuation strong and sharp ; the punctures in the discoidal impression (which is very shallow and ill-defined) moderately large and very slightly separated, at the sides they are smaller and crowded together. There are two small spaces at the base which have only a few punctures. The elytra are rusty brown, the margin and costæ blackish. There are four smooth costæ, the first abbreviated before the middle, the second and third well marked, the fourth fine and abbreviated at the base and apex. The double lines of foveæ between the suture and the second costa and the second and third costæ are regular and the foveæ are subquadrate. The foveæ which form the more lateral lines are regular, but a little less quadrate. Viewed beneath, the lateral ridge of the thorax is very sharp. The whole underside is clothed with fine grey pubescence. The abdomen is very distinctly and rather closely punctured. There is an oval, brown, pubescent spot on the basal segment.

Long. 14 mm.

Hab. St. Domingo [or possibly Dominica].

This species is very close to *P. Chevrolati*, but is smaller, and the lines of punctures on the elytra are very regular.

A single specimen from an old collection, with the locality indistinctly written.

Polycesta Gossei, sp. n.

Elongate-oblong, much flattened, green ; elytra ferruginous, shaded with green at the suture. Thorax at the widest scarcely wider than the elytra, only slightly angular at the sides, obliquely narrowed in front, very slightly narrowed posteriorly ; green, shaded with purple-coppery at the base. Disk lightly impressed ; the punctures rather coarse, very close, and rather confused, rather smaller at the sides, with two spots at the base which have only a few punctures. Elytra subparallel, with a not very distinct costa near the scutellum extending about a quarter the length of the elytra. There are two other very distinct smooth costæ. The foveæ which form the double lines are very regular and somewhat round. Beyond the second complete costa there are four rows of regular somewhat round foveæ or large punctures. The underside is a beautiful bluish green, the legs, parts of the sterna, and margins of the segments shaded with purple. Tarsi cyaneous. The abdomen has some fine greyish pubescence, and on the basal segment there is a brown velvety spot.

Long. 11 mm.

Hab. Jamaica (*Gosse*).

This species is very near *P. velasco*, L. & G., but that has a rather more angulated thorax, &c. It is possible that *velasco* and *montezuma*, L. & G., may be sexes of the same species, but there is not material at hand to enable me to decide.

Polycesta variegata, sp. n.

Elongate, brownish coppery, slightly shining, gently convex. Thorax obtusely angular at the sides, broadest just behind the middle, obliquely narrowed in front and towards the base, the lateral angle rounded, the posterior angles very slightly projecting and acute. Disk with a distinct but shallow longitudinal impression, narrow in front, broader at the base. The punctures on the disk are moderately strong, not close together; at the sides they are smaller, crowded together, leaving a few irregular raised lines. Base smooth in the middle, blackish. Elytra gently convex, variegated with æneous black spots and marks, each elytron with a fine costa next the suture, extending nearly to the apex; the second and fourth costæ very distinct, wide at the base, becoming gradually narrower to the apex; the third costa is represented by a slightly raised line in the basal part of the interval between the second and fourth costæ. There are lines of moderately strong punctures, not very equal in size and mixed with much smaller ones. The spines at the apex are rather strong and acute. The punctures on the middle of the abdomen are moderately strong, not very close together, horseshoe-shaped; at the sides the punctuation is close and rugose; the apical segment is closely punctured and has a fine raised median line at the apex.

Long. 17 mm.

Hab. Mexico (*Höge*); from the Godman and Salvin collection.

In general appearance this species much resembles *P. tonkinea*, Fairm., but that has the thorax less angular at the sides, and the first costa of the elytra is abbreviated and thick, in this species it is fine and complete.

Acmæodera luzonica, Nonfr.

Acmæodera luzonica, Nonfr., Berl. ent. Zeit. xl. p. 302.

Herr Nonfried describes this species as bronzy green. All the British Museum specimens from Luzon &c. which appear to belong to this species are nearly black, a single example from Siam being somewhat purple-violet. It is confounded in most collections with *A. stictipennis*, L. & G.,

which is a deep steel-blue insect. Apart from the colour, this species differs from *stictipennis* in the lateral yellow stripe of the elytra. In the Indian *stictipennis* the yellow stripe is at the base single for a short distance, and is then double (*i. e.* occupies two interstices) until it reaches the transverse postmedian spot. In *luzonica* the yellow on the submarginal interstice stops halfway between the shoulder and the transverse spot, so that the yellow stripe occupies only one interstice at the middle.

Acmæodera grandis.

The species of this group differ so much in the colour of the sexes that the males have in most cases been described as distinct from the females.

The males are generally dark-coloured, bronzy or coppery, the females bright metallic green or blue.

A. grandis, Guérin, is a female; *cuprina,* Fåhr., is the male of the same species in all probability, but I notice that the male *cuprina* in the Museum collection from N'Gami shows a slight tendency to carination at the apex of the elytra, which I do not see in the specimens from Abyssinia received with the female *grandis.* I believe, however, that they are all one species.

Acmæodera viridiænea, De Geer.

A. viridiænea, De Geer (Mém. vii. p. 631), is a female and *A. æneicollis,* De Geer (p. 632), is the male of the same species. *A. violacea,* Gory, is a female, and I believe *A. gibbosa,* Oliv., also a female, is the same.

Acmæodera subalveolata, Th.

A. chrysoloma, Th., is the male of *A. subalveolata,* Th. By the kindness of M. Oberthür I have been able to examine the types of these species. Both are described on p. 61 of the 'Typi Buprestidarum,' *subalveolata* being described first.

Acmæodera puella, Bohem.

A. puella, Bohem. (Œfv. K. Vet.-Akad. Förhandl. for 1831, p. 12), is a female, and *A. luculenta,* described on the next page, is probably the male.

Acmæodera repercussa, L. & G.

This is a male. The species of this group are extremely difficult to determine, and at present there is only one male

in the Museum collection that agrees well with the type of *repercussa*. The specimens labelled *repercussa* in Capt. Kerremans' collection are males of *A. viridis*, Kerr. They differ from the type in M. Oberthür's collection in not having the sutural striæ impressed, but striato-punctate.

A. aurolimbata, Bohem., is a male, and, according to a specimen from N'Gami labelled "compared with type" by Mr. Saunders, is very close to *repercussa*, but is rather less convex and has the dorsal area æneous green; the disk of the thorax is rather closely and somewhat strongly punctured. The suture and first and second interstices of the elytra smooth at the extreme base only. The sides are densely punctured, but not transversely rugulose.

The colour of the elytra, according to description, should be cyaneous.

A female received from N'Gami with the above-mentioned male is green, and, as is usually the case, is less punctured on the elytra, the sutural interstices being smooth for half their length.

I am inclined to believe that *aurolimbata* may be only a variety of *repercussa*, of which *viridis* is the female. *A. fossicollis*, Harold, may also perhaps be female of the same.

A. gabonensis, Th., is a female. I could not find any specimen in the Museum to agree quite with the type. The type has the thorax rather narrower than is usual in *viridis*, the disk is finely punctured, and the median furrow less marked. It may be an extreme variety.

Acmæodera posticalis, L. & G.

A. posticalis. L. & G., the type of which, by the kindness of M. Oberthür, I had the opportunity of examining, is a female. It resembles a small *A. viridiænea*, but is, I think, nearer *A. viridis*, Kerr., the elytra having the interstices carinulate at the apex. A specimen in the Museum is entirely violet. In the type the violet colour and green shades are irregular and, I should imagine, not natural.

It may be an extreme variety of *viridis*.

Acmæodera fascigera, Harold.

The sexual differences are not so striking, but the males have the base of the elytra very dark.

Acmæodera Klugii, Saund.

The sexes of this species are alike.

Acmæodera aurifera, L. & G.

This is a female. Capt. Kerremans has described the male as *A. scintillans*.

Acmæodera Saundersii, sp. n.

Bright golden green, shining, the head and the suture of the elytra having a blue tint in certain lights. Underside dark steel-blue, with a little silky pubescence.

Long. 16 mm.

Hab. Limpopo.

This species closely resembles *A. grandis*, ♀, but differs in having the thorax less angular at the sides, rather more narrowed in front. The central channel is rather broader in the middle—*i. e.*, in *grandis* it is nearly straight; in this species it is more elliptical, closely and rather strongly punctured. The sides are closely and strongly punctured, and, although rugose about the middle, the punctures do not make *transverse* rugæ as in *grandis*. In *grandis* there is a small, rather sharply defined fovea on each side of the base. In *Saundersii* there is a larger, deep, punctured impression, which is continued forward and obliquely outwards. The elytra are strongly punctate-striate. The suture and the first and second interstices are subcostate, smooth, the first interstice with an irregular line of fine punctures beyond the middle, the second punctured only at the apex. In *grandis* the apical part of these interstices has a line of very distinct punctures. The rest of the interstices are much broken up by the coarse punctures of the striæ, but in *Saundersii* the punctures are not so strongly transverse as in *grandis* and the fourth costa is raised and almost smooth, whereas in *grandis* it is punctured as the others.

Acmæodera sumptuosa, sp. n.

I propose this name for specimens received in Capt. Kerremans' collection—the males as *A. aurolimbata*, Fåhr.*, the females as *grandis*, Guér.

It is very like *A. grandis*, but is rather broader and rather more suddenly or obliquely narrowed towards the apex of the elytra.

* Care must be taken not to confound *aurolimbata*, Fåhr. (a small insect 7½ mm. long), with *aureolimbata*, Bohem. (15 mm. long). For this latter insect Capt. Kerremans proposed the name *Bohemani* (Mém. Soc. Ent. Belge, i. p. 167), but confounds the two in the Buprestidæ of Wytsman's 'Genera,' p. 30.

♂.—Above dark brown, with faint æneous or cyaneous tint, the margins of the thorax and elytra coppery. Thorax with the median channel narrow elliptical, densely punctured (not coppery). The surface on each side of this channel extremely finely and delicately punctured; all the lateral region coarsely punctured; the punctures crowded together towards the sides, smaller and rounder than in *grandis*. Elytra rather more dilated behind the humeral sinuosity than in *grandis*, the suture and first and second interstices smooth at the base, the first punctured beyond the middle, the punctures crowded but so arranged at the apex that there is a tendency to leave fine carinæ; the second interstice slightly costiform and smooth almost to the apex. The remaining interstices densely punctured, the punctures smaller and closer than in *grandis*, the third and fifth interstices almost obliterated by the punctuation.

♀.—Bright golden green. Thorax with the median channel golden, the smooth surface slightly tinted with cyaneous. Elytra with the suture cyaneous, the colour becoming golden on the disk. The margins bright coppery. The punctuation throughout is rather less dense than in the male.

Long. 14–17 mm.

Hab. "Afrique or. mer." ♂; "Afrique, S.E." ♀. "Heyne."

Acmæodera aureolimbata, Bohem.

Acmæodera Bohemani, Kerr.

The Museum has a specimen of this species from Mr. Saunders' collection marked as compared with type. It is a female.

Acmæodera natalensis, Kerr.

The type of this species is a trifle shorter than the one just mentioned as *aureolimbata*, but I much doubt it being distinct.

Acmæodera Jamesi, sp. n.

Oblong, rather broad, golden green, shining. Elytra with the second interstice broad and nearly flat, almost smooth; the fourth and sixth slightly raised, with a few punctures; the third and fifth closely punctured at the basal half, with a single line of punctures at the apex. Body beneath dark steel-blue.

Long. 13 mm.

Hab. Somali (*F. L. & W. D. James*).

General form of *A. viridiænea*, De Geer, but much less convex. Clypeus very deeply emarginate. Thorax with the central channel not very deep, elliptical, closely punctured. The surface on each side finely punctured; the sides densely and coarsely punctured, but the punctures are smaller and much closer than in *viridiænea*. The basal fovea on each side of the base is deep and sharply defined. The suture is rather flat, smooth, except a few fine punctures at the apex. First interstice flat, with an irregular line of fine punctures; second very broad, nearly flat, with a few fine punctures; third not quite so broad as the second, densely punctured at the base, with transverse zigzag rugæ, the apical half with a single line of punctures; the fourth somewhat raised, especially at the base, smooth, with a few fine punctures; fifth like the third. Apex slightly tinted with blue.

This species is peculiar on account of the sculpture of the elytra.

Acmæodera De Geeri, sp. n.

Our Museum received from Capt. Kerremans' collection two specimens labelled "*æneicollis*, De Geer, Transvaal." These are distinct from a specimen from Mr. Saunders' collection labelled "*æneicollis*, De Geer; compared with type." This latter is the male of *viridiænea*, as I have already mentioned.

The two specimens from Transvaal must therefore be a new species.

It closely resembles *A. viridiænea* in form and general appearance. Head bright coppery; thorax bright coppery red, with the disk dark cyaneous. This dark patch is much narrower than in *viridiænea* and is obliquely narrowed to a point at the anterior margin; it is so finely punctured that at first sight it appears quite smooth; each puncture bears a fine black hair. There is a narrow, punctured, coppery median line. The elytra have the suture and the first and second interstices shining dark cyaneous (extended a little on the third interstice posteriorly), the rest of the elytra bright coppery red. The coppery margin in *viridiænea* is always narrow.

The second specimen has the elytra less brightly coloured, the sutural area being brownish coppery and the sides tinted with coppery.

Long. 12 mm.

Hab. Transvaal.

Acmæodera tricolor, sp. n.

Bright green, the disk of the thorax and the suture of the elytra violet, the margins of the elytra tinted with golden. ♀.

Long. 12 mm.

Hab. Damara (*Heyne*, ex coll. *Kerremans*).

Somewhat intermediate in form between *A. viridiænea* and *A. grandis*. Thorax scarcely broader than the elytra at the base, not much rounded at the sides. Median channel elongate elliptical, the punctures moderately large and moderately close together. The disk tinted with violet, the punctures fine but distinct near the base, strong and moderately close together in front, the punctures becoming crowded together at the sides. Elytra with the suture violet, with a single line of punctures behind the middle. First interstice smooth, with an irregular line of punctures from about the middle; second interstice smooth, gently convex, with a few punctures at its sides near the apex; the remaining interstices in the discal area much interrupted by punctures and zigzag rugæ, but flat and with a single line of rather strong and somewhat closely placed punctures towards the apex. Body black beneath.

Acmæodera Brooksi, sp. n.

Bluish green, the disk of the thorax and suture of the elytra violet-blue; apex of the elytra carinate. ♀.

Long. 12 mm.

Hab. Buluwayo, Matabele Land (*F. Brooks*).

Size, form, and appearance of *A. viridiænea*, but rather more blue-green than that species usually is, and with the entire suture and apex of the elytra violet-blue. It is at once distinguished by the carinæ at the apex of the elytra. Thorax with the median channel elongate-elliptical, closely punctured; the punctures on the disk on each side of the channel are rather fine and slightly separated, but they become gradually less fine and closer towards the sides. The sides closely punctured, the punctures much smaller than in *viridiænea* and closer together, but not confused as they are in many species, and there is a small smooth spot towards the anterior angles. Elytra with the suture and the first and second interstices smooth for two thirds their length, then with a line of punctures that become more impressed towards the apex, and the interstices have their margins raised and slightly cariniform. The third and fourth interstices have a line of punctures for their entire length,

their apices similar to the first and second. The sides are rather finely transversely rugulose. Body beneath black.

Acmæodera Yerburyi, sp. n.

Brassy, cylindrical, convex. Elytra on the back with alternate lines of coppery and steel-blue; towards the side a rather broad blue stripe (bordered on each side by a golden line) which turns to the suture near the apex; the margin reddish coppery.

Long. 6 mm.

Hab. Arabia; Lakej and Aden (*Col. Yerbury*).

Very near *A. Foudrasi*, Sol., but smaller, less acuminate, and differently coloured. Thorax brassy, the punctures on the disk very fine and more separated than in *Foudrasi*. Elytra with lines of small punctures on the back, the punctuation rather stronger towards the sides, but less strong throughout than in *Foudrasi*, the striæ deeply impressed at the apex. On the back the colour is in lines, alternately coppery and steel-blue; then there is a rather broad stripe of dark blue which is bordered on each side by golden. The whole margin reddish coppery, but with blue more or less mixed.

Demochroa Bowringii, sp. n.

Form and appearance of *D. gratiosa*, Deyr. Thorax with the sides coppery red. Elytra obscure purple, with a yellow fascia behind the middle; the basal half of the lateral margin and suture at the scutellum narrowly bordered with green; the apex more or less coppery.

Long. 28 mm.

Hab. Cahar (*Bowring*); Sikkim; Himalayas.

Differs from *D. gratiosa* in having the sides of the thorax coppery and the green at the suture of the elytra limited to the extreme base within the first short stria, and in the apex of the elytra being coppery.

Demochroa Meldolana, sp. n.

Form and appearance of *D. gratiosa*, Deyr. Thorax obscure purple, the sides green, with coppery tints. Elytra dark green, with purple shade when viewed obliquely, with a broad yellow fascia behind the middle. The humeral margin, the suture at the extreme base (within the first short costa), and the costæ bright green; the apex broadly tipped with bright green.

Long. 24 mm.

Hab. Andaman Islands (*R. Meldola*).

Differs from *D. gratiosa* in having the elytra dark green and the pale green of the suture restricted to the extreme base, &c. It differs from *D. Bowringii* in being smaller, in the colour of the elytra, and in having the apex bright pale green instead of coppery.

It is worthy of notice that this form is nearer to the Himalayan *D. Bowringii* than to *D. gratiosa* from Penang.

Chrysochroa Fruhstorferi, sp. n.

Form and arrangement of colour as in *C. rugosicollis*, Saund. Head and thorax very dark, obscure purple, the latter slightly cyaneous on the disk, rather closely and strongly punctured, the sides rugose. Elytra very pale yellow, the basal half of the margin, a large somewhat triangular patch before the middle, and the apical third nearly black, the extreme apex tinted with æneous. Sternum purple; abdomen bluish æneous. ♂ ♀.

Long. 42–50 mm.

Hab. Tonkin (*H. Fruhstorfer*).

Specimens of this species were received with the name *rugicollis*, Saund., attached. I think, however, that they are distinct. In addition to the difference in colour it is distinguished by being less elongate, and the thorax shorter and broader. This is particularly noticeable in comparing the males.

Chrysochroa vittata, Fabr.

C. vittata, F., is allied to *C. ocellata*, F., and not to *C. chinensis*, with which it is so often associated in collections.

C. vittata, *ocellata*, *fulgens*, *similis*, and *Ludekingii* form a group having the thorax somewhat constricted in front and the elytra emarginate at the apex.

Chrysochroa unidentata, Fabr.

I think the synonymy of this species, as given by Capt. Kerremans' list in Wytsman's 'Genera,' p. 48, is not quite correct. *C. marginata* and *C. sublineata* should be associated with *C. mutabilis*. The true *C. unidentata* has the thorax dark coppery, with two well-defined green vittæ.

Chrysochroa Thelwalli, sp. n.

Head coppery. Thorax golden green, with a purple

marginal spot which is bordered by reddish coppery. Elytra golden green, with a broad yellow vitta on each, with a narrow dark cyaneous line between the yellow and the suture. Abdomen coppery, clothed with ashy pubescence at the sides. ♀.

Long. 26 mm.

Hab. Nyassa (*Thelwall*).

Closely resembles *C. lepida*, Gory, but differs in being of a lighter golden green. The thorax is more finely punctured at the sides.

[To be continued.]

XXXVIII.—*Description of and Reflections upon a new Species of Apodous Amphibian from India.* By A. Alcock, M.B., LL.D., F.R.S., Superintendent of the Indian Museum and Professor of Zoology in the Medical College of Bengal.

[Plate VII.]

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§ 1. The Question of the *Cæciliidæ*.
§ 2. The Distribution of the *Cæciliidæ* compared with that of certain *Sublittoral* Genera of Hermit-crabs.
§ 3. The Distribution of the *Cæciliidæ* explicable on the Theory of a Tethyan Sea.
§ 4. Description of *Herpele Fulleri*, sp. n., from Cachar in the Province of Assam.
§ 5. Table of the *Cæciliidæ*.

§ 1. The Question of the *Cæciliidæ*.

The Apodous Amphibia (Cæciliidæ) are of interest, not only to the morphologist, but also on account of their geographical distribution, for since these animals are specially modified for a subterranean life, it is difficult to understand how any of the ordinarily invoked modes of dispersal can have operated upon them.

Up to the year 1895, according to Boulenger (P. Z. S. 1895, pp. 401–414), 42 species of Cæcilians were known—namely, from tropical America 26, from tropical West Africa (north of the Equator) 4, from East Africa 4, from Seychelles 3, from India and South-east Asia 5.

Since the publication of Mr. Boulenger's paper 2 more species have been described from tropical America and 1 each from West and East Africa; and I have now to place on

record another new species, from Cachar, bringing up the number of Indian species to 6.

The Indian Cæcilians hitherto known belong to three genera, of which one, *Ichthyophis*, is found only in the Oriental region; another, *Gegenophis*, is peculiar to the southern end of the Indian peninsula; while the third, *Uræotyphlus*, is represented in Southern India (Malabar) and in West Africa just north of the Equator (Gaboon).

The new Indian species, which comes from the district of Cachar in the province of Assam, belongs to a genus, *Herpele*, of which three other species are known, namely, *H. ochrocephala*, Cope, from Panama, and *H. squalostoma* (Stuchbury) and *H. Bornmuelleri*, Werner, from West Africa (Gaboon and Senegambia).

The range of this genus *Herpele*, which touches practically all the salient strongholds of the order to which it belongs, seems striking enough to require some special explanation, for it can hardly be supposed that the immediate ancestors of a form that is modified for underground life and guards its eggs in its burrows could, even though its larvæ live for a time in fresh water, be transported through 170° of meridian and across great oceans solely by those distributing agencies that are recognized by zoologists who maintain that continents and oceans are permanent.

§ 2. The Distribution of the *Cæciliidæ* compared with that of certain *Sublittoral* Genera of Hermit-crabs.

It has occurred to me that some light is thrown upon the case of *Herpele* and upon the distribution of the Cæciliidæ in general by the geographical affinities of certain elements of the sublittoral fauna of the seas of India.

I am of course aware that ordinary marine animals, both as adults and even more in their larval stages, are supposed to live under simpler conditions and to be less restrained by physical barriers than land animals. Without arguing that question, I may, perhaps, minimize the force of this objection by selecting the *sublittoral* hermit-crabs (Paguridæ), very few of which have even the most moderate swimming-powers, and a good many of which—as we may conclude from the comparative large size and fewness of their eggs—do not periodically squander a multitude of unspecialized larvæ abroad.

I have lately completed a sort of monograph of the Paguridæ, and I find that the species inhabiting the sub-

littoral slopes of Indian seas appear to be part of a sublittoral fauna which, though showing a certain circumtropical tendency, is concentrated at certain definite points in the Northern Hemisphere and is correspondingly deficient at certain definite points in the Southern Hemisphere. The striking points of concentration are (1) the West Indian region, including to a less noticeable extent the Bay of Panama, (2) that part of the North Atlantic that lies between the Azores and Cape Verde and that washes the corresponding shores of South-western Europe and North-western Africa, and (3) Oriental seas from India to the Philippines (and Japan); and the striking deficiencies are (1) the coasts bounding the South Atlantic, and (2) the south-western corner of the Indian Ocean.

Table I.—*Showing the Geographical Affinities of the Sublittoral Hermit-crabs of India.*

Name of Genus.	Tropical American region (Atlantic).	North Atlantic coasts of Europe & N.W. Africa.	South Atlantic coasts of America south of Pernambuco.	South Atlantic coasts of Africa.	East coast of Africa.	Oriental Seas.	Remarks.
1. *Pylocheles*	*	..	..	..	..	*	Not elsewhere.
2. *Chiroplatæa*	*	..	..	..	..	*	Not elsewhere.
3. *Catapagurus*	*	..	..	..	..	*	Also N.W. Atlantic and Pacific.
4. *Tomopaguropsis* ..	*	..	..	..	..	*	Not elsewhere.
5. *Glaucothoë*	..	*	..	..	..	*	Also Pacific.
6. *Nematopagurus* ..	..	*	..	..	..	*	Also Mediterranean.
7. *Paguristes*	*	*	..	1 sp. (Cape)	1 sp. (G.Aden)	*	Also Mediterranean and Pacific.
8. *Sympagurus*	*	*	..	..	..	*	Also N.W. Atlantic and Pacific.
9. *Spiropagurus*	*	*	..	..	..	*	Also Pacific.
10. *Anapagurus*	*	*	..	1 sp. (Cape)	..	*	Also Mediterranean.
11. *Cancellus*	*	*	..	..	..	*	Also Pacific.
12. *Parapylocheles* ..	..	..	..	..	..	*	Not elsewhere.
13. *Paguropsis*	..	..	..	..	..	*	Not elsewhere.
14. *Pagurodes*	..	..	..	..	..	*	Also W. Pacific.
15. *Pylopaguropsis* ..	..	..	..	..	..	*	Not elsewhere.
Total genera	9	7	..	2 (2 sp.)	1 (1 sp.)	15	

The state of affairs is exhibited in the preceding table, from which I have eliminated *Parapagurus*, as it is rather abyssal than sublittoral, and *Eupagurus*, as it is cosmopolitan and as much littoral as sublittoral. And I must emphasize the fact that the reference is to sublittoral genera only, *i. e.* to groups the majority of species of which live on the submarine "shoot" or continental slope. [The land and littoral hermit-crabs of India are, by the evidence both of genera and species, parcel of a tropical marine province that extends from the coast of East Africa to the eastern confines of Polynesia.]

§ 3. The Distribution of the *Cæciliidæ* explicable on the Theory of a Tethyan Sea.

Now the point to which I would here draw attention is that the regions where these sublittoral hermit-crabs are concentrated show some remarkable coincidences with those where *Herpele* and the Cæciliidæ in general are found; and it seems to me that we have here (quite apart from any other sources of evidence) some conceivable outlines of a sea or chain of archipelagoes that may at some former time have extended, under uniform conditions, north of the Equator, from Panama eastwards, by way of Africa, into South-east Asia. Of this sea the hermit-crabs in question might be supposed to be part of the residual littoral or sublittoral fauna, while *Herpele* might be one of the relics of the land-fauna of its southern coasts.

As to the time when this great sea may be supposed to have existed, all that can here be said is that the Cæcilians are quite unknown in a fossil state and that the earliest indisputable remains of Paguridæ are referred by palæontologists to the Eocene.

It is, perhaps, hardly necessary to remark that the southern limits of this supposed sea correspond fairly well, both in space and time, with Professor Suess's Tethys.

Nor, perhaps, is it necessary to state that numerous other writers, both geologists and zoographers, have discussed the question of former land-connexions between India and Africa on the one hand and between Africa and South America on the other, and that the connexion between India and South Africa is regarded by many competent geologists as sufficiently established by evidence. This connexion, which is well known by the name "Lemuria," is believed to have included Madagascar, and may have extended into the Tertiary period; it explains the presence of Cæcilians in the Seychelles and the absence of the hermit-crabs in question from the east coast of Africa.

As regards the connexion between tropical Africa and tropical America, across the mid-Atlantic, the geological evidence is of itself too fragmentary to be convincing, though zoological testimony in its favour is steadily accumulating. Further investigation is needed, and the lines on which it may be conducted have been fully discussed by Dr. A. E. Ortmann in a most interesting paper upon "The Geographical Distribution of Freshwater Decapods and its bearing upon Ancient Geography," published in the 'Proceedings of the American Philosophical Society,' vol. lxi. no. 171, for 1902. In that paper also copious references to zoo-geographical literature are to be found.

§ 4. Description of *Herpele Fulleri*, sp. n., from Cachar in the Province of Assam.

Herpele, Peters.

Herpele, Peters, MB. k. Akad. Berlin, (1879) 1880, p. 939; Boulenger, Cat. Batr. Brit. Mus. 2nd edit., 1882, p. 100, and P. Z. S. 1895, p. 409.

"Squamosals in contact with parietals; eyes over-roofed by bone. Two series of teeth in the lower jaw. Tentacle globular, surrounded by a ring-like groove, situated below and posteriorly to the nostril. Cycloid scales imbedded in the skin."

Herpele Fulleri, sp. n. (Pl. VII.)

The snake-like or worm-like body gradually increases in girth from the base of the shark-like snout to a point near the stump-like hinder end.

The head is about $\frac{1}{17}$ of the total length. The snout is long and sharp and far overhangs the mouth. The nostril is lateral, and a short way below and behind it (in a vertical line with the symphysis of the lower jaw), and on a slight eminence, is a minute globular circumvallate tentacle.

The mouth-cleft is wide. The teeth of the upper jaw, vomer, and palatine are small, recurved, and stand in a single series; those of the lower jaw are in two series and are larger.

No traces of eyes are visible until the skin is removed, when the minute eyes are seen lying beneath the bones of the head.

Behind the head the integument forms 101 rings, of which those near the after end of the body are the narrowest.

The epidermis is finely, profusely, and sharply areolated, the areolæ corresponding with small dermal scales, which are very plain when the epidermis is removed.

Colours: snout and lips yellowish; head light brown; the rest of the body chocolate-brown, becoming almost black dorsally in its posterior part; the extreme edges of most of the rings also are blackish in most of their extent.

The total length of the unique specimen is 220 mm. The diameter behind the snout is 3 mm. and near the after end of the body 9 mm.

Named after the Hon. Mr. J. B. Fuller, C.S.I., C.I.E., Chief Commissioner of Assam.

Discovered in a miscellaneous collection of snakes from Kuttal, 6 miles south-west of Silchar in Cachar; purchased from Mr. C. B. Antram.

§ 5. Table of the *Cæciliidæ*.

In conclusion, and for comparison, I append a table showing the distribution of the Cæciliidæ; it is taken from Boulenger's paper in the P. Z. S. for 1895, with the recent discoveries added.

Table II.—*Showing the Distribution of the* Cæciliidæ.

Name of Genus.	Tropical America.	West Africa.	East Africa.	Seychelles.	India.	
Ichthyophis	..	..	..	..	2	Also S.E. Asia.
Dermophis	4	1	1			
Hypogeophis	..	..	1	2		
Cæcilia	6					
Amphiumophis ..	1					
Rhinatrema	3					
Geotrypetes	..	1				
Uræotyphlus	..	1	..	..	2	
Cryptopsophis ..	..	..	..	1		
Herpele	1	2	..	..	1	
Gymnopis	4					
Typhlonectes	3					
Chthonerpeton ..	2					
Siphonops	4					
Bdellophis	..	..	1			
Gegenophis	..	..	..	..	1	
Scolecomorphus ..	..	..	1			
Boulengerula	..	..	1			
Total species ..	28	5	5	3	6	

EXPLANATION OF PLATE VII.

Fig. 1. *Herpele Fulleri*, natural size.
Fig. 1 *a*. Head seen from above, enlarged.
Fig. 1 *b*. Head seen from the side, enlarged.
Fig. 1 *c*. Two rings of the body, enlarged.
Fig. 1 *d*. Posterior end of the body, ventral view, enlarged.

XXXIX.—*Description of a new Coleopterous Insect from Bounty Island.* By Capt. Thos. Broun, F.E.S. *With Note by* J. J. Walker, Esq., F.E.S.

[The Bounty Islands are a small group of granitic islets and rocks (about twenty in number) occupying a space of about 3 miles by 2, the highest summit being 290 feet above the sea. They are about 490 miles to the eastward of the south extreme of New Zealand, in the lat. 47° 44′ S., long. 179° E. All the islets are entirely destitute of fresh water or land vegetation of any sort, but are frequented by myriads of penguins and other sea-birds. Capt. F. W. Hutton, F.R.S., has described (Trans. N. Z. Inst. xxvii. p. 174, 1894) a large and conspicuous Stenopelmatid cricket, *Ischyroplectron isolatum*, from the Bounty Islands, and suggests that it may feed on the dead seaweed.—J. J. Walker.]

Group **Hydrophilidæ**.

Thomosis, gen. nov.

Body convex, oviform. *Antennæ* 9-articulate, their basal joint as long as the following five combined, gradually incrassate towards the extremity; second cylindric, barely half the length of the first; third longer than broad; fourth and fifth short; sixth also short, but distinctly broader than the preceding one; club three-jointed, oblong-oval, pubescent, the intermediate joint rather shorter than the others. *Labrum* porrect, medially incurved. *Epistome* broadly emarginate. *Eyes* flat, smooth. *Mentum* broad, flat, not transverse. *Femora* punctate, the intermediate distinctly pubescent; the posterior with minute almost indistinguishable pubescence, their punctuation closer and finer at the base than beyond it. *Tibiæ* stout; the anterior with two small denticles on the outside near the extremity and two or three higher up; they are armed at the apex with two stout unequal spurs; the other pairs are bicalcarate and bear coarse ciliæ. *Tarsi*

moderately elongate, not compressed, pilose; basal joint of the posterior short, second and fifth of about equal length. Front *coxæ* large, prominent, and contiguous; the middle pair widely separated. *Sternal lamina* large and plane, tapering from the base of the metasternum to beyond the middle coxæ. *Mesosternal process* vertical and short, its suture curvate.

This is nearly allied to *Hydrostygnus*, but may be readily distinguished therefrom by the large prominent coxæ. The antennæ differ and the club is shorter and broader, and the maxillary palpi are less slender.

Thomosis guanicola, sp. n.

Oblong-oval, nude, moderately nitid, nigro-piceous; legs and lateral margins pitchy red; palpi and antennæ usually testaceous; body closely and moderately finely punctured.

Head not half the width of the thorax, longer than broad, subconical. *Thorax* almost twice as broad as it is long, regularly curvedly narrowed towards the front, lateral margins well developed. *Scutellum* triangular. *Elytra* with ten series of distinct but not coarse punctures on each; the sutural at the apex almost form striæ.

Underside nigrescent, mostly densely and finely sculptured, with short, inconspicuous, dark ashy pubescence. *Abdomen* with five segments, the three central nearly equal, the basal subcarinate along the middle.

Length $3\frac{1}{2}$, breadth $1\frac{3}{4}$ lines.

Bounty Islands.

Found by Mr. L. Cockayne feeding on deposits of guano.

Auckland, New Zealand,
27th August, 1903.

XL.—Niphargus Kochianus, *Bate, in an Irish Lake and* N. subterraneus, *Leach, in Kent.* By W. F. de Vismes Kane, M.R.I.A.

[Plate VIII.]

The following notes on the occurrence of one of these blind crustaceans in the open waters of Lough Mask will be of value, especially as in many respects they tend to confirm certain opinions held by Forel, Humbert, and others in connexion with allied species of Amphipoda. Several genera and many

species of small blind Crustacea, both Isopoda and Amphipoda, are known to inhabit wells and caves in many parts of the world. Chilton has described no less than six from New Zealand, Packard and Cope several from North American cave-waters, while those of France, Switzerland, and elsewhere in Europe have occupied the attention of numerous zoologists.

Niphargus and the nearly related *Crangonyx* have been referred by some early authors to *Gammarus* as the ancestral type, of which the most familiar species is *Gammarus pulex*, the common "freshwater shrimp." But careful examination of the respective generic characters has resulted in a general consensus of opinion that these blind subterranean genera have originated from some extinct freshwater ancestor with eyes, from which *Gammarus* has also descended, so that they are not merely modified and degenerate Gammarids. And this view has certainly been strengthened by the discovery of an eyed form of *Crangonyx* (*gracilis*, Smith) in Lake Superior, while others have been found in surface-streams in America, and in Tasmania a nearly related form, also with eyes, has been noticed. More than one species of *Niphargus* with perfect eyes are known too from the Caspian and Black Seas. It seems, therefore, extremely probable that the blind subterranean Crustacea descend from widely distributed freshwater eyed forms, some of which are still extant. In English wells, especially in the southern counties, several blind forms of *Niphargus* and one *Crangonyx* are known to occur. Only recently the writer obtained specimens of *N. subterraneus*, Leach, and probably *N. fontanus* (*puteanus*, Koch), from deep wells near Lynsted, Kent. But in Ireland, so far, only *N. Kochianus*, Bate, from a well near Dublin, has been recorded. This species has never been hitherto found in an open sheet of water. Two other blind species have, however, been found in freshwater lakes: namely, *N. orcinus*, discovered in 1868 by Gustav Joseph in the Lake of Zirknitz, where he reports them to be plentiful and that they come to the surface in fine weather after sunset. They frequent the brooks flowing from the hill-grottoes of Carniola, whence he supposes them to have descended into the lake. Another, *N. subterraneus*, var. *Forelli*, found by Prof. Forel in the deep waters of Lake Leman, has been carefully described by Alois Humbert. It was subsequently discovered in five other Swiss lakes, and both Forel and Humbert eventually came to the conclusion that they found their way thither from subterranean sources, and got acclimatized to their new habitat. The phenomenon of hereditary blindness

which these and similarly situated animals display has been the subject of much discussion among biologists, of whom Packard and Semper may be mentioned, some holding that the effect of disuse of the organ has brought about its partial or total degeneration, others that in localities where light prevails the individuals with perfect vision would survive those with defective sight, and that natural selection would secure the maintenance of these valuable organs; but that where darkness makes the possession of sight in no way advantageous to the possessor the eyed and eyeless forms would breed together and have equal chances in the struggle of life, with the result that every degree of atrophy of the parts of the eye might be expected to supervene till a totally blind race resulted.

Examples illustrating each stage of this degeneration have been discovered in such situations. Leydig, writing of the blind *Niphargus subterraneus*, mentions the fact that some specimens have been observed with pigment-spots in the region of the eye, and states that he has found that though the optic ganglion is present the eye is wanting. Chilton remarks of the subterranean blind species of New Zealand that in only one species has he discovered any external traces of eyes, namely two or three small lenses without pigment *, and he thinks it probable that in different species there may be great differences in the amount of degeneracy of the eyes, and perhaps also in individuals from different localities.

A lake form of the common *Gammarus pulex* at Wä lenschwyl was found by Prof. Asper to have both blind and eyed forms at a depth of 40 metres. Similar facts have been adduced by other authors in regard to lake varieties of the Isopod *Asellus* &c. Packard, in his description of the cave-fauna of North America, mentions that in the genus *Cecidotæa* one species is without even a vestige of an eye, though in others there are imperfect traces. It is therefore interesting that among about 130 specimens of *Niphargus Kochianus* from Lough Mask I found three which had well-developed pigmentation, and a fourth which showed a cloudy shading in the optic region. But, in the absence of opportunity to have careful sections made by a competent zoologist, it is impossible to say how far the structure of the eye may be preserved in these specimens. The absence of colour is likewise another general characteristic of subterranean fauna.

* "Subterranean Crustacea of New Zealand," C. Chilton, Trans. Linn. Soc., 2nd ser. Zool. vol. vi. pt. 2, p. 220.

But it is remarkable that in considerable oceanic depths a strange uniformity of orange coloration obtains among Crustacea, Hydroids, and other marine organisms, a remarkable instance of which the writer once had the opportunity of observing. Chilton, quoting from Prof. S. I. Smith on this phenomenon, goes on to say that he has been unable to find any parallel instances of this that are in any way conclusive with regard to the animals found in the deep waters of lakes, such as those of Switzerland. In the present case, therefore, the orange colour of the Lough Mask *Niphargus* is notable. Specimens from the Dublin well are diaphanous.

The following are the circumstances of the capture:—In the last days of June 1903 I made an expedition to Lough Mask, in the county of Mayo, with the object of pursuing investigations as to its Entomostracan fauna and also in the hope of finding *Mysis relicta*. I brought with me a kind of dredge designed especially for use in freshwater lakes, by the aid of which I had captured that crustacean in abundance in Lough Neagh and Lough Erne. By the kindness of Col. Knox, of Creagh, I was provided with a suitable boat and man, and spent the greater portion of a day dredging the deeper parts of that picturesque lake in depths varying from about 100 to 150 feet. No *Mysis* were taken. By adjusting its mouth I was able either to pass the net at a height of about 1 inch above the level of the floor of soft mud, or to skim it so closely at other times in the hope of taking Ostracoda as to pick up a little of the upper layer of loose débris, much of which I believe consisted of fish-excrement. All this was reserved for future examination, and a sample of the mud itself taken up by reversing the dredge. On examining this material I noticed a few minute Amphipoda of an orange colour which from time to time appeared on the surface of the muddy water and then burrowed out of sight. They swam sideways, like *Gammarus*, but when undisturbed crawled in an upright position. Of these I secured a small series, which were duly despatched by post to the Rev. Canon Norman, whose kind assistance on similar occasions has been frequently afforded me; and subsequently he wrote that he was much interested in my find, which was a blind *Niphargus*, and that it would be of importance to secure a long series if possible, because some of the specimens were mutilated by the loss of the terminal uropoda, and it was desirable to ascertain the sexual characters. About six weeks later, therefore, I made a second journey to the west, and again experienced the kind hospitalities of Creagh. The result was highly satisfactory, for in two days, the first of which was so stormy that I only with

some risk reached the dredging-grounds, and could venture only two short hauls of the dredge, I secured about 130 examples at a depth of from 130 to 150 feet, some of which were only about 2 mm. long and of a paler orange than the larger specimens, probably being younger. The phenomenon of the existence of these blind Crustacea, usually inhabitants of subterranean waters, made me desirous of testing the adjacent Lough Corrib also for these animals, as I was aware that the two lakes have underground communications. Accordingly I spent two days (the 13th and 14th August) on the latter, which off Cong, where the outflow of Lough Mask enters it, reaches its deepest soundings, one other area on the western shore some miles away only excepted. I therefore dredged along the shore of the narrow isthmus which divides the two sheets of water, in the bays, and also in moderate depths of 60 to 70 feet bordering the shore, for a distance of about two miles, but without success. I then tested the depths further out in the lake, with the unexpected result that a moderate number of *Mysis relicta* rewarded my efforts, but not a single *Niphargus*. These deeper soundings reached from 110 to 132 feet, and the floor of the lake varied from soft mud to a hard gravelly bottom, with occasional stones. The results of my researches, therefore, though highly gratifying, were exactly the reverse of my expectations. Searching for *Mysis* in Lough Mask, I took *Niphargus Kochianus*, and following up what I thought to be its probable extension to Lough Corrib, I met with *Mysis relicta*, both of them remarkable captures.

The question arises as to the origin of this normally subterranean species in the open waters of a lake. Two allied species, as already mentioned, have been described from similar localities on the Continent, and both of them were presumed to have been derived from underground sources, that from the Lake of Zirknitz presenting little room for doubt. A similar explanation for the presence of *Niphargus Kochianus* in Lough Mask is available. The northern and eastern shores of this picturesque sheet of water are for the most part flat, with only slight undulations, and consist of horizontal strata of carboniferous limestone, which extend south along Lough Corrib to Galway. As is well known, the rain-water accumulating in its hollows and fissures has, in the course of ages, dissolved the softer strata and formed underground channels and reservoirs, sometimes of great extent and miles in length. Many such subterranean waters find their way into, and others take their rise from, Lough Mask. Its western shore, however, is of igneous

rock, and the granitic chain of the Partry Mountains rises from it steeply into heather-clad summits, the last and most northerly of which is drained on its further side by streams which, wandering down into the limestone lowland, sink into the rock and pursue an unseen course for long distances, till, rising again, they fall into the lake. The number of these subterranean sources at the northern end I am not able to state with certainty, but their volume is considerable. On the S.E. shore, about half a mile from the lake, I visited a natural cavern through which a stream passes, but from whence or whither no one can say. Further to the south, in a bay not far from Lough Mask Castle, the waters of the lake flow with a strong current against the base of a terraced ridge of limestone, which rises in gradual escarpments from the verge, and the roar of the disappearing currents can be distinctly heard among the fissured crags. These effluent waters doubtless find their way into Lough Corrib, which is only separated by a low isthmus, about two miles broad, of limestone, through and under which channels exist which void their waters in several magnificent fountains under a cliff near Cong. I look forward to some future opportunity of investigating these interesting districts and the subterranean fauna which they doubtless contain.

With regard to the *Niphargus*, which was finally determined by Dr. Norman to be *Kochianus*, Bate, very little has hitherto been published respecting its sexual characters. Spence Bate, who first described the species*, had but a single specimen, which had lost the terminal uropoda. He states that the posterior pair of pleopoda were missing, but, to judge from the figure, all three seem to have been mutilated. Chilton also, in his description of this species, states that for want of a sufficient series for comparison he was unable to put forward any statement of sexual characters. The long series now available from Lough Mask somewhat explains the difficulty, as they show that the notable difference in shape and size which characterizes the uropoda of the two sexes in other species of *Niphargus* does not exist in *N. Kochianus*, and that therefore they are of little use in the determination of sex. In fresh specimens, however, those of the female seem somewhat more robust and are slightly shorter than those of the male; but the average difference in length is too inappreciable for the purpose of identification, by itself, of individuals. Moreover, the proportion of their length to the body seems to vary among examples of the same sex. This

* Nat. Hist. Review, 1859, vol. vi. Proc. Soc. p. 165.

may perhaps be accounted for by the difficulties of alimentation, which in some instances would result in the stunted size of adults, whose organs might be proportionally longer than younger but well-nourished individuals of the same body-length. The following table will illustrate this. The length of body is measured from the extremity of the head to the base of the third uropod. The figures given are hundredths of an inch.

Males (probably).		Females (probably).	
Body length.	Length of uropod.	Body length.	Length of uropod.
16·5	2·5	15	2
14·5	2·5	14	2·2
14·5	2·3	14	2
12·5	2		
11	2		

The position of the telson relatively to that of the body and third uropod seems to me some index to the sex. In going through a long series I noticed that in normal attitudes with the body fairly extended the telson of the female lies parallel to, and often rests upon the uropod, but in the male it stands more erect and at right angles to the body-segment. The posterior (fifth) pair of pereiopods are proportionally longer in the female, reaching to the middle, or in large specimens even beyond the extremity of the third uropod, when the body lies straight and the appendage is drawn backwards parallel to it. In the male they scarcely reach the base of the uropod. The brood-plates of the adult female are, of course, when they can be detected, the most certain indication of that sex. One additional observation remains to be added. In dissecting the buccal apparatus I found entangled in the setæ of the first maxillary palp a specimen of *Chydorus ovalis*. Those observers who have examined the contents of the intestinal canal of species of *Niphargus* report it to consist chiefly of sandy débris and portions of algæ. The presence of an entomostracan in the mouth-organs certainly proves nothing, but the presumption is that these creatures may feed on animal as well as on vegetable tissues, when they are available. My experiments with *N. subterraneus* and *Kochianus* substantiate this.

Niphargus subterraneus, Leach.

In the same autumn I made some investigations on the chalk tablelands above Sittingbourne, Kent. Here deep excavations are necessary to tap a spring. The results were

highly interesting. Specimens of *Niphargus* occurred in five out of eight wells examined in the vicinity of Lynsted to about three miles westward. I could not perceive their relative depths to be a factor in determining the presence of these blind Amphipods, as will be seen by the following synopsis of results :—

No. 1.—About 120 feet deep. *N. subterraneus* fairly numerous and from 3 to 13 mm. in length of body. The larger individuals, over 8 mm., were captured in a different manner, and I took them to be *N. fontanus*. Numerous Protozoa were present and *Cyclops fimbriatus*, and also the dead bodies of flies, beetles, and other insects in scanty numbers. Probably these as well as algæ, of which, however, I secured none, may have provided food. Several blind springtails from the walls were secured.

No. 2.—About 150 feet deep and ¾ mile distant. Had been emptied and cleaned the previous year. Only *Cyclops fimbriatus* and specimens of a minute diaphanous worm with pink intestines were found.

No. 3.—Near no. 1, about 60 feet deep. A springtail only.

No. 4.—About ¾ mile distant, 80 feet deep. What I took to be *N. fontanus*, Bate, was fairly numerous and about ½ inch long. Five of them measured 9, 10, 10, 13, 14 mm. respectively. The Ostracod *Cypria ophthalmica* was here extremely numerous, with eyes as well developed as in a surface specimen *Cyclops fimbriatus* and a pseudoscorpion (from wall probably) completed the list, beside various drowned insects.

No. 5.—About 1½ mile from no. 1, 160 feet deep or thereabouts, and of very wide diameter. Among much débris only six *N. subterraneus* 2 to 5 mm. were taken. Also *Cyclops fimbriatus*, two pseudoscorpions apparently the same species as the above, *Cypria ophthalmica* numerous, and one blind springtail.

No. 6.—About 2½ miles distant, 150 feet deep. Six *N. subterraneus*, 2–4 mm.

No. 7.—Near the former, about 100 feet deep. A few *N. subterraneus* of similar small size.

No. 8.—3½ miles from no. 1, over 380 feet deep. The bottom full of chalky detritus stained deeply with oxide of iron. No *Niphargi* captured. One *Cyclops serratulus*, var. *varius*, ♀; two *Cyclops viridis* (*gigas*) probably, but the fifth feet not discernible; two pseudoscorpions. Wings and relics of insects numerous.

There could be no question as to the species of the smaller specimens of *N. subterraneus* taken in these investigations; but on the third attempt made in no. 1 well I left a net baited with meat all night. All the resulting specimens differed considerably in some respects from the series of small ones taken previously, notably in the gnathopoda, of which the propodos was less quadrangular in shape, the dactylos much more oblique, and the postero-ventral angles of the pleon-segments more acute. The first pair of gnathopoda had the propodos so approximately pear-shaped (see Pl. VIII. fig. 4) that I concluded this larger series to belong to *N. fontanus*, Bate. The series taken in the ordinary manner in the daytime from no. 4, which were all large, proved to be similarly characterized, and no small individuals being among them, I concluded the *Niphargi* of this well must belong to the same species as the last captures in no. 1. One of these, however, submitted to Canon Norman was considered, however, by him as referable to *N. subterraneus*, Leach, although he acknowledged that the existence of the above-mentioned characters made the diagnosis less certain. It was also sent to M. Chevreux, who has recently figured a *Niphargus* from France as *N. fontanus*, Bate, and he, I understand, identifies it as identical. However, Canon Norman's suggestion (*in litt.*) that large specimens possibly developed these divergences of characteristics seems borne out by my more critical examination subsequently of the whole series taken; and a reference to the figures will show that, though the first gnathopoda of specimens about ½ inch long are somewhat pear-shaped and the palm more oblique, yet they do not exactly correspond to the figures given of *N. fontanus* by Spence Bate (Nat. Hist. Rev. vol. vi. Proc. Soc. p. 164). If Bate's figure was not very accurately engraved it might possibly represent a mature stage of *N. subterraneus*, Leach,—a conclusion I am inclined to adopt, the more because the proportions of the pleopoda seem to be abnormally curtailed in the figures given by him both of *N. Kochianus* and *N. fontanus*. Further researches may possibly elucidate the truth, and it seems possible that wells

situate in the lower levels and valleys of Kent may yield even larger and more interesting results when I have the opportunity of resuming the investigation.

EXPLANATION OF PLATE VIII.

N. Kochianus, Bate, from Lough Mask.

Fig. 1. Terminal uropoda, male and female (to scale).
Fig. 2. Mandible.
Fig. 3. Posterior lip.

N. fontanus, Bate (?),=*N. subterraneus*, Leach.

Fig. 4. Gnathopod of first pair.
Fig. 5. Second pair of gnathopoda.

From a specimen half an inch in body-length from no. 4 well, near Sittingbourne, Kent.

XLI.— *On some new Species of Silver-Pheasants from Burma.* By Eugene W. Oates.

Amongst the Pheasants that I have received from Burma during the last two years there are three well-marked new species of Silver-Pheasants. The first two that I shall describe belong to an entirely new section of these birds, in which the males combine a black wing with a barred tail, and the females have the middle tail-feathers with the two webs of different colours. The third species is of remarkable interest, as it has now been rediscovered after an interval of eighty years. The bird was, however, never described nor named, and it was only known from a coloured drawing.

Gennæus obscurus, sp. n.

In the adult male the head, crest, and the whole lower plumage are glossy blue-black. The hind-neck, mantle, back, and all the upper wing-coverts are bluish black, sparingly speckled with pale buff. The rump-feathers and upper tail-coverts are bluish black, broadly margined with white and very sparingly dotted with pale buff on one or both webs. The primaries are brown; the secondaries black, with a few buff specks on the margin of the outer web of each feather. The outermost tail-feather is black; the middle pair black with narrow, broken, diagonal white bars on the whole of both webs, except the terminal quarter of the outer web, the margin of the basal half of the inner web

being plain white. The remaining tail-feathers are of an intermediate character, the second from the outside being black with a few specks of white at the base of the outer web and the feather next the middle pair being black with a few diagonal white lines on the basal three-fourths of the outer web.

In another male, which is probably a year younger than the specimen described above, the specks or dots on the upper plumage, wing-coverts, and secondaries are more numerous and form narrow, zigzag, broken lines. The markings on the tail-feathers are less numerous and the middle tail-feathers have the inner web entirely black.

Length of wing 9·25 inches, of tail 11·5 inches. The legs are of a brown colour.

The female resembles the female of *G. Horsfieldi* in all respects, except in the coloration of the tail. The general colour of the plumage is reddish brown, the feathers edged paler and vermiculated in an indistinct manner with black; those of the breast and belly marked with cream-coloured shaft-streaks. The quills of the wing are brown, mottled with fulvous on the outer webs. The outermost tail-feather is entirely black; the next six are also black, the second from the outside having a few white specks at the base of the outer web, the specks increasing in number on each successive feather and gradually combining into narrow wavy bars, the seventh feather being cross-barred all over, except at the tip. The two middle feathers are of a rich dark chestnut on the outer web and of a pale chestnut on the inner, both webs being longitudinally marked with wavy black bars, those on the outer web being much broader than those on the inner. Length of wing 8·5 inches, of tail 9·5 inches. The legs are of a brown colour.

Both sexes of this pheasant were sent to me by Captain W. G. Nisbett from the Katha District of Upper Burma.

Gennæus Cliffordi, sp. n.

In this species the male is unique in being streaked with white on the mantle, and the female is remarkable in having black spots on some of the feathers of the wing.

In a very old male the head, crest, and the whole of the lower plumage are glossy blue-black. The hind-neck and mantle are black, each feather with a narrow streak, which is white mottled with black, and about an inch in length. The upper back is plain black. The lower back and rump are black, each feather with a white margin and one or two

broken white vermiculations just above the margin. The primaries are dark brown; the secondaries black, with a few white specks on the margins of the outer webs of the outermost feathers. The upper wing-coverts are black, a few of the lesser coverts with white shaft-streaks; the inner median and greater coverts with a very narrow but conspicuous white margin. The middle tail-feathers are diagonally marked with equal bands of black and white, the margin of the inner web being plain white. The next feather is black, everywhere banded narrowly with white. The next is black, sparingly marked with broken bars of white. The next, again, is black with a little white at the base only. The four outer feathers are plain black. The upper tail-coverts are black, covered with broken white bands more or less parallel to the margin.

Length of wing 10 inches, of tail nearly 16 inches. The legs are brown.

A young male, with the spurs half-grown, has the plumage of the same character as the bird just described, but differing in some details. The streaks on the mantle are large and triangular, extending in some cases to nearly the whole of the feather, and the white much broken up. The upper wing-coverts are speckled with white, and the white margin to the inner median and greater coverts is indistinct. The visible portions of the rump-feathers are black with a broader white margin, but lacking the broken white vermiculations above the margin. On the other hand, there is much white speckling on the concealed portions of the feathers. The middle tail-feathers, which have only a very slight curl outwards, are black, very sparingly banded with white. The next three are still more sparingly marked and the outer four are entirely black.

Length of wing 9·5 inches, of tail nearly 10 inches. The legs are of a brownish flesh-colour.

The female has the upper plumage and wing-coverts of a russet-brown colour, each feather vermiculated with black, the shaft and the margin much paler, some of the inner median and greater coverts with a black patch or large spot near the tip of one or both webs. The primaries are brown; the secondaries brown vermiculated with black and mottled with rufous, the innermost with a black patch near the tip of the outer webs. The middle tail-feathers are dull chestnut on the inner web, vermiculated with black; and black on the outer web, vermiculated with chestnut on the margin. The other tail-feathers are all black. The lower plumage is black, the margins of the feathers pale brown. Each feather

of the breast and belly has a very broad, pointed, ochraceous streak, occupying quite half of the feather and in some cases three-quarters, and mottled with black. The feathers of the sides of the body and flanks have bright ochraceous shaft-streaks.

Length of wing 9 inches, of tail 8·5 inches. The legs are pale brown.

Specimens of this pheasant have been sent to me by Lieut. R. Clifford, of the 22nd Punjabis, and I have much pleasure in associating his name with the species. It occurs in the Myitkyina District, east of the Irrawaddy river.

Gennæus assimilis, sp. n.

In the year 1826 Crawfurd went on a mission to the Court of Ava and in the course of his travels met with a pheasant, of which a coloured drawing was made. So far as I can ascertain, nothing was known of this drawing till Gould reproduced it in the background of his plate of *Diardigallus prælatus* in his 'Birds of Asia.' I have often looked at this drawing of Gould's and wondered why the artist should have depicted the female of *Gennæus rufipes*, the Ruby Mines Pheasant, with flesh-coloured legs. The mystery was cleared up when I received from the Ruby Mines a bird which corresponded precisely with Gould's figure. On writing to one of my correspondents, I learn that there is in the Ruby Mines District a pheasant with pale legs, very similar in other respects with the red-legged species, and equally well known. I hope, therefore, soon to acquire the male.

The female of the present species has the whole upper plumage and the upper wing-coverts of a uniform umber-brown, the shafts and the margins of the feathers somewhat paler; the crest a darker brown, vermiculated with black; the upper tail-coverts also thickly vermiculated with dark brown. The primaries are dark brown, mottled with fulvous on the outer webs; the secondaries are umber-brown, vermiculated with black. The tail-feathers are diagonally barred and vermiculated with a combination of umber-brown, fulvous, black, and very pale buff, the inner webs being darker and more coarsely marked than the outer. The whole lower plumage is dark blackish brown, each feather with two broad, zigzag, V-shaped marks of an ochraceous colour, the outer being close to the edge of the feather, the inner much smaller and frequently forming only an irregular and coarse streak on and about the shaft. Length of wing nearly 10 inches; of tail 10 inches. The legs are flesh-coloured.

The main points of difference between the female of this species and those of *G. rufipes*, of which I have a large series, are the flesh-coloured legs, and the absence of black vermiculations on the upper plumage and upper wing-coverts.

XLII.—*Footprints of small Fossil Reptiles from the Karroo Rocks of Cape Colony.* By H. G. Seeley, F.R.S.

No record has hitherto been published of the footprints of the animals which have left their remains so plentifully in the Karroo rocks. I examined a considerable area of the Colony in the search for these evidences of the habits of the animals without success; and neither Mr. Thomas Bain nor Dr. Kannemeyer had ever met with any footprints in the rocks. Suitable surfaces for their preservation are not uncommon in large exposures of ripple-marked shale which occur on the Pareiasaurian horizon.

One small slab is preserved in the palæontological museum of the University of Munich, where it has remained since 1880. It is labelled "Middelburg," presumably the well-known locality in the north-east of Cape Colony, and with it is a small new Theriodont skull from the same locality which, when the matrix is removed, may prove to be allied to *Hyorhynchus*.

When I drew the attention of the late Professor K. v. Zittel to the interest of the specimen, he had a cast made and placed in my hands for description. This cast has been presented to the Natural History Museum, Cromwell Road.

The small block of fine sandstone, where it is broken at the edge, shows the impressions of bones of small digits, which terminate in sharp compressed claws, making an interesting difference from the absence of bones with footprints in the Trias of this country, which may lead to a future discovery of definite association of footprints of South-African reptiles with the bones of animals which made them, as the reward of systematic exploration.

The surface of the slab appears to be crossed by two or three faint parallel marks an inch or two apart, which are probably ripple-marks, and the larger footprints tend to cross these obscure markings at an angle of about 45°. At least three animals are indicated varying in size. The largest has the feet about the size of those of *Procolophon*, and shows a similar stoutness and divergence of the digits, so that the prints may be provisionally referred to that genus; but the

smaller animals have the digits parallel and indicate types of which the skeleton is undiscovered. The footprints are in relief and, owing to the nature of the sediment, are fairly sharp, but the terminal extremities of the digits appear in some cases to be broken.

The fore and hind feet of the left side of the *Procolophon* type of animal are shown in close sequence. The fore foot (fig. A) is slightly the smaller and less perfectly preserved, and is slightly obscured on the inner side by the overlap of a small foot with four digits. Behind this pair of footprints the cast shows a short longitudinal impression (fig. C), which in relief is concave from side to side, with a narrow median line, and shows a quincuncial pattern of small pits. This marking seems to indicate a fine granular ornament of the skin on the under surface of the tail at a point one inch and a half behind the left hind foot. As the marking extends forward on the slab it becomes obscure. If it is correctly referred to the tail of the same animal it shows such a mark as might be made by the extremity of the tail of *Procolophon*, which is well known.

In both fore and hind feet the moderately stout digits terminate bluntly without any indication of terminal claws, though this may result from the condition of preservation of the impression. The digits diverge on a splay-footed plan, so that the first makes an angle of nearly 90° with the fifth. The middle digit appears to be the longest, and the first, second, and third appear to be stronger than the fourth and fifth. The fifth digit of the hand is obscure. The digits are more impressed than the metacarpal and metatarsal regions, and there are deeper impressions on the inner than on the outer side. The width of the hand did not greatly exceed one inch, and it may have been an inch and a quarter long, though its hinder border is not well defined.

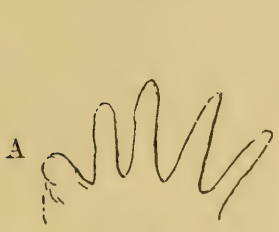
The impression of the hind foot (fig. B) immediately follows the fore foot. The front to back measurement over both impressions is two and a half inches. The transverse width between the extremities of the first and fifth digits is one and a half inches; at the tarsal margin the width is eight-tenths of an inch. The digital impressions become narrower from the first to the fifth, which is slender and faint, so that its terminal extremity is ill-defined. The third, fourth, and fifth digits appear to be of equal length, but this may result from the extremity of the third being lost.

The comparatively short metatarsal area is defined by a series of fleshy convexities in the lines of the several bones, with shallow grooves between them. The first metatarsal

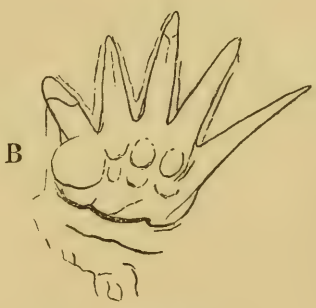
bone is the shortest and supports a prominent ball-like convexity, which extends a little inward laterally beyond the digit. The convexities over the distal ends of the second, third, and fourth metatarsal bones are much smaller; they are similar to each other in size and elevation. There is no convex pad on the fifth metatarsal. The transverse hinder tarsal margin of the impression is formed of three convex curves—one behind the first metatarsal, the second (wider) behind the second, third, and part of the fourth metatarsals, and the third (smaller) behind the fourth and fifth metatarsals. These curves appear to indicate the structure of the proximal row of the tarsus.

If these footprints prove to belong to *Procolophon*, it is not impossible that the Cheshire footprints, which most resemble them, may prove to belong to *Telerpeton*.

The smaller footprints are isolated and less well preserved. They appear to indicate animals in which the digits were four in number, with three of them close together, resembling some small types from Storeton in likeness to the human hand, being relatively narrow.



Fore foot.



Hind foot.



Caudal (?) impression.

The larger footprints from Middleburg.

XLIII.—*On a new Type of Reptilian Tooth* (Ptychocynodon) *from the Upper Karroo Beds near Burghersdorp, Cape Colony.* By H. G. Seeley, F.R.S.

In 1897 Dr. Kannemeyer discovered and sent to me the fragment of a tooth which is now described. He fully appreciated the scientific interest of the fossil, and I have only delayed making his discovery known in hope that the labours and acumen which have added so much to our knowledge of South-African reptiles might have been rewarded with more complete evidence of the animal.

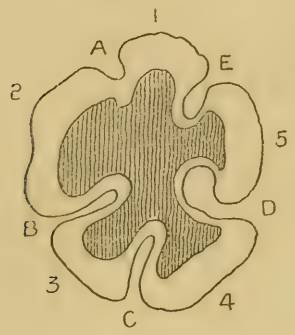
The fragment, which is less than an inch and a quarter long, appears to be a portion of a large stout tusk of a new genus of fossil reptiles with canine teeth comparable to the Dicynodont type. In transverse section it measures one inch and a half from back to front and an inch and a quarter from side to side. It was presumably long, for the decrease in transverse measurements towards the fractured extremity is very small.

This tooth differs from all genera of reptiles hitherto known in having the tooth-substance folded longitudinally into a few large flexures, which are not symmetrical and vary in size, giving rise to an angulated pulp-cavity. The appearance is that of a plastic substance which had become corrugated by compression, and, yielding towards the pulp-cavity, had acquired a complex folded structure. But in the transverse section the microscopic condition of the dentine is normal and leaves no doubt that the folding is a tooth-character of a new type differing fundamentally from that of known Labyrinthodonts. The root of the tooth exposes a five-rayed pulp-cavity. Each ray corresponds to one of the five parallel vertical convex bars or folded flutings which make the external surface of the tooth. This basal extremity is broken and weathered, showing that the tooth has long been separated from the skull. The dense tooth-substance is about two tenths of an inch thick on each of the five bars. These bars are divided from each other by narrow folds directed inward, which vary in depth and size. The walls of these inlets are thin, being less than half the thickness of the intervening tooth-substance.

Owing to strain in the undulatory movements which have affected these rocks the continuity of the thin walls of the inlets is sometimes broken, giving the pulp-cavity the appearance of opening externally. The anterior inlet A (fig. 1) is the

smallest and scarcely affects the pulp-cavity, but the other four are deeper than wide; B and C on the external border are narrower than D and E on the internal border. All are to be described as canals which are open externally. They are fewer and larger than the grooves on the roots of teeth

Fig. 1.



Outline of the proximal surface, showing the five bars of the tooth (1–5) and inward folds (A–E) which divide up the pulp-cavity.

of some species of *Ichthyosaurus*, and rather suggest the folded condition of the teeth in genera of mammals which approximate to South-African reptiles in parts of their skeletons.

Fig. 2.



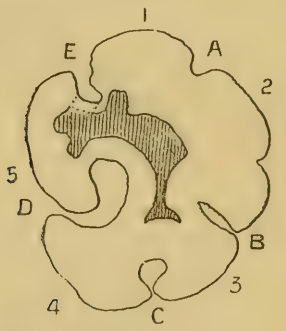
Transverse section in the middle of the specimen, showing the diminishing pulp-cavity.

To determine the structure of the tooth more exactly it was divided transversely in the middle of its short length. The

external wall of dentine is now seen to thicken at the expense of the pulp-cavity, which has lost its five-rayed form and become more L-shaped. The inner wall of the canal E appears to be broken, but the inner walls of the other canals have thickened, especially on the external side of the tooth (fig. 2).

The distal fracture of the tooth is much more recent and shows the pulp-cavity reduced to a curved hamate form situate towards the inner side of the tooth and only two tenths of an inch wide in the middle. The inlet E is imperfectly separated from the pulp-cavity, probably from the effect of strain, though the partition of dentine between them remains as thin as in the basal section (fig. 1). The inlet D retains its comma- or flask-shaped form without decrease in size. The inlets C and B are almost entirely closed by the approximation of the lateral external walls (fig. 3). The tooth-substance in which they are contained is fully half an inch thick, but on the inner side of the tooth the walls of dentine are only from one to two tenths of an inch thick.

Fig. 3.



Distal fracture of the tooth.

These inlets have been regarded by Dr. Kannemeyer as comparable to the poison-duct in the tooth of a venomous serpent. The inlet D is essentially of this character, and although the entire tooth is to be desired before the inference can be regarded as established, it is not improbable that all the canals may be outlets for poison-glands.

Externally the five bars of the tooth are vertically ribbed with six to ten slightly elevated, blunt, parallel, linear stripes, which are stronger on the outer than on the inner side. There is a very slightly elevated girdling ridge, situate below

the transverse section, which may possibly indicate the dividing limit between the crown and the root, which I suppose to have been imbedded in the jaw. There are very faint transverse lines of growth beyond this ridge.

If the crown of the tooth were short, each lobe or bar of the tooth might be expected to terminate in a cusp, so that a complex five-cusped reptilian tooth might originate from folding extending through the root and crown, as in Mammalia like Edentates and Rodents. If the tooth is rightly interpreted as a canine, then it might be followed by molar teeth of similar complexity, and tend to show that the cuspidate character of certain mammalian and reptilian teeth may not always be due to the mechanical influences of opposing surfaces and varied movements of the jaws.

There is no distinct layer of enamel beyond a surface-skin. The calcigerous tubes of the dentine are always at right angles to the external surface, remarkably dense, straight, and parallel, always bending at the folds of the dentine as they extend inward, so that the tubes tend to be approximately parallel. There is no appreciable difference from the tube-structure in *Dicynodon*, though the tubes may be slightly larger. The species may be known as *P. pentangulatus*.

XLIV.—*Rhynchotal Notes.*—XXVI. By W. L. Distant.

HOMOPTERA.

Fam. Cicadidæ.

In revising the genera of this family, in preparation for a projected complete synonymic Catalogue of the Cicadidæ, I propose to publish in advance descriptions of such new genera and species as become necessary, and to give preliminary synopses of the classification suggested. The synonymy is somewhat extensive, and will be better deferred to the pages of the Catalogue itself.

Subfam. *Cicadinæ*.

Cicadinæ, Dist. Mon. Orient. Cicad. p. 3 (1889).

Division Polyneuraria.

Lateral margins of the pronotum ampliated and more or

less angularly produced. Head (including eyes) about as wide or wider than base of mesonotum, or sometimes little more than two thirds of its width; costal membrane of tegmina sometimes much arched and dilated, the apical cells usually eight in number, but sometimes smaller in size and much more numerous; tegmina varying in hue from pale hyaline to dark opaque.

Synopsis of Genera.

I. Tegmina with eight apical areas.
 1. Head (including eyes) about as wide or wider than base of mesonotum.
 A. Costal membrane of tegmina not prominently dilated nor arched at base.
 a. Head frontally produced, not truncate, above about as long as pronotum (excluding its posterior margin).
 b. Pronotum with its posterior margin only a little less in length than that of its vertex; its lateral margins medially angulately expanded, the angular apices reaching to or nearly to the apex of basal cell of tegmina.. *Ioba*.
 c. Pronotum with its posterior margin little more than half the length of its vertex; its lateral margins medially angulately expanded, the angular apices only reaching to about middle of basal cell of tegmina *Muansa*.
 d. Pronotum with its posterior margin not more than half the length of its vertex.
 e. Lateral pronotal margins medially angulately expanded, the angular apices reaching base of basal cell of tegmina.... *Sadaka*.
 ee. Lateral pronotal margins a little prominent, but not medially angulately expanded and not reaching basal cell of tegmina .. *Koma*.
 aa. Head not frontally produced, more or less truncate and deflected in front of eyes.
 f. Outer and posterior membranal margin to wings very broad, about one third their length *Munza*.
 ff. Membranal margin to wings normal, narrow.. *Platypleura*.
 B. Costal membrane of tegmina prominently arched at base and dilated, about as wide or wider than costal area.
 g. Head frontally produced, not truncate, about as long as pronotum (excluding its posterior margin) *Yanga*.
 gg. Head not produced, deflected in front of eyes .. *Kongota*.
 2. Head (including eyes) only about or little more than two thirds the width of base of mesonotum.
 C. Pronotal lateral margins ampliated or angulated, the angular apices not or only reaching base of basal cell of tegmina.

h. Costal membrane of tegmina prominently arched at base and dilated.
i. Costal membrane of tegmina much narrower than costal area *Umjaba*.
ii. Costal membrane of tegmina always as broad or broader than costal area *Pycna*.
D. Pronotal lateral margins strongly angulately ampliated, the angular apices reaching the middle or near apex of basal cell of tegmina.
hh. Costal membrane not prominently arched at base and only moderately dilated..... *Ugada*.
II. Tegmina with numerous, always more than eight, apical areas.
a. Tegmina semihyaline, only more or less reticulately veined on apical area; opercula not quite reaching middle of abdomen..... *Angamiana*.
aa. Tegmina opaque, venation on apical half dense and furcate; opercula not extending beyond basal segment *Polyneura*.

Ioba, gen. nov.

Head (including eyes) wider than the base of the mesonotum, not truncate anteriorly, but with the lateral margins of the vertex a little oblique on each side and the front prominently produced; pronotum transverse, its posterior margin only a little less in length than the vertex, the lateral margins strongly and angulately produced on each side, the angulations medial, their apices when the tegmina are expanded reaching near or to about the end of the basal cell; mesonotum about as long as the pronotum; anterior femora with one or more distinct spines, posterior and sometimes intermediate tibiæ spined on apical areas; metasternum elevated and centrally sulcated; tympana covered; opercula short, broad, their apices more or less convexly rounded; rostrum reaching the posterior coxæ; tegmina with the basal cell broad, irregular, with four, or sometimes five, angles; ulnar veins widely separated at their bases; interior ulnar area somewhat broadened at apex.

Type, *I. leopardina*, Dist. (*Pœcilopsaltria*).

Muansa, gen. nov.

Head (including eyes) slightly wider than base of mesonotum, not truncate anteriorly, but frontally produced, about as long as pronotum (excluding its posterior margin); pronotum transverse, its posterior margin little more than half the length of vertex, the lateral margins strongly and angulately produced, angular apices reaching to about middle of basal cell of tegmina; mesonotum a little longer than pronotum;

anterior femora with one or more distinct spines, posterior tibiæ with a few slender spines on apical areas ; metasternum elevated and centrally sulcated ; tympana practically covered ; opercula short, broad, their apices more or less convexly rounded ; rostrum reaching the posterior coxæ ; tegmina with the basal cell broad, ulnar veins well separated at their bases.

Type, *M. clypealis*, Karsch (*Platypleura*).

Sadaka, gen. nov.

Head (including eyes) about as wide as base of mesonotum, not truncate anteriorly, but frontally produced, about as long as pronotum (excluding its posterior margin) ; pronotum moderately transverse, its posterior margin half the length of vertex, the lateral margins medially angularly produced, angular apices reaching base of basal cell of tegmina ; mesonotum about as long as pronotum ; anterior femora with one or more distinct spines on under surface ; posterior tibiæ with a few slender spines on apical areas ; metasternum elevated and centrally sulcate ; tympana covered ; opercula short, broad, their apices more or less convexly rounded ; rostrum reaching the posterior coxæ ; tegmina with the basal cell short and broad ; ulnar veins well separated at their bases.

Type, *S. virescens*, Karsch (*Platypleura*).

By the hyaline and non-opaque tegmina and wings this genus resembles the subgen. *Oxypleura* (*Platypleura*), from which it is at once separable by the frontally produced head.

Koma, gen. nov.

Head (including eyes) wider than base of mesonotum, not truncate anteriorly, but frontally produced, about as long as pronotum (excluding its posterior margin) ; pronotum slightly shorter than mesonotum, its posterior margin about half the length of vertex, the lateral margins moderately dilated, slightly angulated, but not reaching basal cell of tegmina ; anterior femora with one or more distinct spines on under surface ; posterior tibiæ with a few slender spines on apical area ; metasternum elevated and centrally sulcate ; tympana large ; opercula short, broad, in type the margins oblique ; rostrum reaching the posterior coxæ ; tegmina with the basal cell short and broad ; ulnar veins well separated at their bases.

Type, *K. bombifrons*, Karsch (*Platypleura*).

Munza, gen. nov.

Head (including eyes) a little wider than base of mesonotum, subtruncate and deflected in front of eyes; pronotum transverse, about as long as mesonotum, its posterior margin a little more than half the length of its vertex, its lateral margins dilated and a little angulated, but not reaching the basal cell of tegmina; anterior femora not spined; posterior tibiæ longly spined on their apical halves; metasternum a little elevated and centrally sulcate; tympanal coverings somewhat small; opercula short, broad, their lateral and posterior margins a little oblique and sinuate; rostrum reaching the posterior coxæ; tegmina with the basal cell broadened apically; wings with the outer and posterior membrane very broad, about one third their length.

Type, *M. laticlavia*, Stål (*Platypleura*).

Genus Platypleura.

Platypleura, Amy. & Serv. Hist. Hém. p. 465 (1843).
Subgen. *Oxypleura*, Amy. & Serv. Hist. Hém. p. 469 (1843).
Subgen. *Pœcilopsaltria*, Stål, Hem. Afr. iv. p. 2 (1866).

Type genus, *Platypleura—P. stridula*, Linn. (*Cicada*).
„ subgen. *Oxypleura—O. clara*, Amy. & Serv.
„ „ *Pœcilopsaltria—P. octoguttata*, Fabr. (*Tettigonia*).

Yanga, gen. nov.

Head (including eyes) as wide or a little wider than base of mesonotum, not truncate anteriorly, but with the lateral margins of the vertex a little oblique on each side, the front produced, about as long as the pronotum (excluding its posterior margin); pronotum transverse, its posterior margin about half the length of vertex, the lateral margins strongly and angulately produced on each side, their apices extending to a little more than the base of basal cell of tegmina; mesonotum a little longer than pronotum; anterior femora with a basal and subapical spinous tubercle; posterior tibiæ with a few spines on apical area; metasternum elevated and centrally sulcate; tympanal coverings moderate in size; opercula short and broad, their apices more or less convexly rounded; rostrum reaching the posterior coxæ; tegmina with the costal membrane much arched at base and dilated, about as broad or broader than the costal area, basal cell short and broad, ulnar veins widely separated at their bases.

Type, *Y. hova*, Dist. (*Pœcilopsaltria*).

Kongota, gen. nov.

Head (including eyes) about as wide as base of mesonotum, anteriorly subtruncate, deflected in front of eyes; pronotum transverse, its posterior margin about half the length of its vertex, the lateral margins ampliately and subangulately produced, their apices extending to about the base of basal cell of tegmina; mesonotum about as long as pronotum; anterior femora basally and subapically tuberculously spinous; posterior tibiæ with a few spines on apical area; metasternum elevated and centrally sulcate; tympanal coverings moderate in size; opercula short and broad, their apices more or less convexly rounded; rostrum reaching the posterior coxæ; tegmina with the costal membrane much arched at base and dilated, broader than the costal area, basal cell very broad; ulnar veins widely separated at their bases.

Type, *K. punctigera*, Walk. (*Platypleura*).

Umjaba, gen. nov.

Head (including eyes) only about two thirds the width of base of mesonotum, not truncate anteriorly, but obliquely deflected in front of eyes; pronotum transverse, its posterior margin about half the length of its vertex, the lateral margins ampliated, a little angulated anteriorly and posteriorly, but not medially, and not reaching base of basal cell of tegmina; mesonotum slightly longer than pronotum; anterior femora tuberculously angulated near base and apex; posterior tibiæ with a few spines on their apical area; metasternum elevated and centrally sulcate; tympanal coverings broad; opercula short, broad, their apices more or less convexly rounded; rostrum just passing the posterior coxæ; tegmina with the costal membrane much arched at base, but very much narrower than the costal area, which is broadly dilated, basal cell very broad, ulnar veins widely separated at their bases.

Type, *U. evanescens*, Butler (*Platypleura*).

Genus Pycna.

Pycna, Amy. & Serv. Hist. Hém. p. 463 (1843).

Head (including eyes) only about two thirds the width of base of mesonotum, not truncate anteriorly, but obliquely deflected in front of eyes; pronotum transverse, the posterior margin about half the length of its vertex, the lateral margins ampliated, but not angulated, and scarcely extending over the base of tegmina; mesonotum about as long as pronotum;

anterior femora tuberculously angulated near base and apex, posterior tibiæ spinous on apical area; metasternum a little elevated and centrally sulcate; tympana well covered; abdomen short and robust; opercula short, very broad, their apices more or less convexly rounded; rostrum reaching the posterior coxæ; tegmina with the costal membrane much arched at base, dilated, and always as broad or very much broader than the costal area; basal cell very broad; ulnar veins widely separated at their bases.

Type, *P. striæ*, Brullé (*Cicada*).

Ugada, gen. nov.

Head (including eyes) only about two thirds the width of base of mesonotum, not truncate anteriorly, but obliquely deflected in front of eyes; pronotum transverse, the posterior margin a little more than half the length of its vertex, the lateral margins strongly ampliated and medially angulated, their apices reaching to middle or near end of basal cell of tegmina; mesonotum about as long as pronotum; anterior femora tuberculately angulate near apex, posterior tibiæ spined on apical area; metasternum elevated and centrally sulcate; tympana well covered; opercula short and broad, their apices more or less convexly rounded; rostrum reaching or passing the posterior coxæ; tegmina with the costal membrane not prominently arched at base, only moderately dilated, basal cell moderately short and broad; ulnar veins widely separated at their apices.

Type, *U. limbata*, Fabr. (*Tettigonia*).

Genus Angamiana.

Angamiana, Dist. Ann. & Mag. Nat. Hist. (6) v. p. 235 (1890).

Type, *A. ætherea*, Dist.

Angamiana floridula, sp. n.

♂. Body and legs black; posterior and posterior lateral margins of pronotum and four discal spots to mesonotum, of which the two longest are central and the two smaller between the angles of the cruciform elevation, ochraceous.

Tegmina ochraceous brown, the venation ochraceous, about basal third and a transverse fascia near middle creamy white, basal cell black, costal membrane ochraceous; wings ochraceous, with a number of elongate castaneous spots on the posterior and apical areas.

Opercula obliquely divergent and reaching the apex of the

third abdominal segment; rostrum reaching the posterior coxæ; face globose, obsoletely longitudinally sulcate and more broadly transversely striate; head (including eyes) much narrower than either anterior margin of pronotum or base of mesonotum; tegmina with the transverse veins at the bases of the numerous apical areas margined with pale ochraceous.

Long., excl. tegm., 41 mm.; exp. tegm. 128 mm.

Hab. "Frontière Chine—Tonkin—Region Lao-Kay" (*Dupont*, Paris Mus.).

Genus Polyneura.

Polyneura, Westw. Arcan. Entom. i. p. 92 (1842).

Type, *P. ducalis*, Westw.

Division Tacuaria.

Lateral margins of the pronotum convex, but not angularly produced, sometimes simply moderately convex or anteriorly subampliated and somewhat toothed; tegmina and wings more or less opaquely coloured.

Synopsis of Genera.

A. Lateral margins of the pronotum somewhat convex, but even.
 a. Head (including eyes) equal in width to that between anterior lateral angles of pronotum.... *Tacua.*
 b. Head (including eyes) narrower than width between anterior lateral angles of pronotum..... *Graptopsaltria.*
B. Lateral margins of the pronotum anteriorly subampliated and somewhat toothed *Tosena.*

Genus Tacua.

Tacua, Amy. & Serv. Hist. Hém. p. 461 (1843).

Type, *T. speciosa*, Illig. (*Tettigonia*).

Genus Graptopsaltria.

Graptopsaltria, Stål, Hem. Afr. iv. p. 3 (1866).

Type, *G. colorata*, Stål.

Genus Tosena.

Tosena, Amy. & Serv. Hist. Hém. p. 462 (1843).

Type, *T. fasciata*, Fabr. (*Tettigonia*).

Tosena Seebohmi, sp. n.

♀. Body and legs black, somewhat opaque; head with the basal lateral margins of face, the space between face and eyes and the anterior angles of vertex above, pronotum with the lateral and posterior margins (the last attenuated and almost broken at centre) and two dentate spots on anterior margin, mesonotum with the basal lateral margins, the posterior disk (which has two black spots), and the cruciform elevation and the lateral margins of the prosternum pale green.

Tegmina piceous, opaque, the costal membrane and costal area pale green, the venation castaneous; a broad creamy-white transverse fascia commencing at end of radial area, where it is broadest, and terminating on lower apical area, where it is attenuated, and with some pale brownish longitudinal streaks in ulnar and apical areas; wings black, somewhat shining, with some pale brownish streaks near apices of apical areas, the largest on abdominal area.

Rostrum passing the posterior coxæ.

Allied to *T. montivaga*, Dist.; apart from some colour-differences, it differs principally from the corresponding sex of that species by the much greater width of the tegmina in wings. In *T. montivaga* ♀ the greatest width of the tegmina is only equal to one third of their length, in *T. Seebohmi* ♀ it is considerably more than one third of their length; the apices of both tegmina and wings are also much broader and less oblique.

Long., excl. tegm., ♀ 45 mm.; exp. tegm., ♀ 148 mm.

Hab. Formosa: Lak-kuli (*Holst*, Brit. Mus.).

The specimen on which this species is founded formed part of the bequest made to the British Museum by the late well-known ornithologist Henry Seebohm, to whom I have dedicated its specific name.

Division Thopharia.

Tympana very strongly developed and sac-like, projecting beyond the lateral margins of the abdomen and extending to about half its length; opercula very small, not reaching base of metasternum; lateral margins of pronotum almost truncate; tegmina and wings talc-like, semihyaline.

Synopsis of Genera.

A. Pronotum very broad, its breadth equalling length of both pro- and mesonotum (including the cruciform basal elevation).

a. Head between eyes as broad as base of mesonotum *Thopha*.

B. Pronotum moderately broad, its breadth considerably less than length of both pro- and mesonotum (including the cruciform basal elevation).
b. Head between eyes much narrower than base of mesonotum *Arunta*.

Genus Thopha.

Thopha, Amy. & Serv. Hist. Hém. p. 471 (1843).

Type, *T. saccata*, Fabr. (*Tettigonia*).

Arunta, gen. nov.

Head transverse, moderately truncate in front of eyes, between eyes much narrower than base of mesonotum; rostrum reaching the posterior coxæ; pronotum moderately broad, its breadth considerably less than length of both pro- and mesonotum (including the basal cruciform elevation); tympana very largely developed and sac-like, their apices obliquely extending beyond the lateral margins of the abdomen and to about half its length; opercula very small, not extending to base of metasternum, placed wide apart, and with their apical margins convex; anterior femora incrassated and spined; posterior tibiæ with a few lateral fine spines; tegmina and wings talc-like, tegmina with eight apical areas.

Type, *A. perulata*, Guér. (*Cicada*).

Division Cyclochilaria.

Abdomen broad, unsymmetrical, medially widened and distinctly abbreviated posteriorly, in the male sex (principally) obliquely depressed on each side, its greatest width almost double that of head between eyes; opercula not extending beyond base of metasternum.

Synopsis of Genera.

A. Lateral margins of pronotum moderately concavely ampliated; head (including eyes) almost as wide as anterior margin of pronotum; abdomen beneath moderately convex *Cyclochila*.
B. Lateral margins of pronotum not convexly ampliated, but considerably narrowed anteriorly; head (including eyes) wider than anterior margin of pronotum; abdomen beneath more or less obliquely depressed from base to apex.
a. Head (including eyes) broader than base of mesonotum; abdomen considerably longer than broad. *Psaltoda*.
b. Head (including eyes) only about as broad as base of mesonotum; abdomen about as broad as long *Henicopsaltria*.

Genus Cyclochila.

Cyclochila, Amy. & Serv. Hist. Hém. p. 470 (1843).

Type, *C. australasiæ*, Donov. (*Tettigonia*).

Genus Psaltoda.

Psaltoda, Stål, Ann. Soc. Ent. Fr. (4) i. p. 613 (1861).

Type, *P. mœrens*, Germ. (*Cicada*).

Genus Henicopsaltria.

Henicopsaltria, Stål, Hem. Afr. iv. p. 7 (1866).

Type, *H. Eydouxi*, Guér. (*Cicada*).

Henicopsaltria pygmæa, sp. n.

♂. Body ochreous brown, abdomen castaneous; pronotum with a central ochraceous line, on each side of which is a narrow black fascia, extending from anterior margin to near middle; mesonotum with two obscure, central, obconical spots on anterior margin, the cruciform elevation ochraceous; abdomen above with the following greyish-white markings, viz.: a small spot at inner angle of each tympanal covering, a broad anterior fascia (broken centrally) to second segment, and the anterior margin of anal segment. Tegmina and wings talc-like, the venation ochraceous; tegmina with the following fuscous spots:—one on each longitudinal vein to third ulnar area, each side of the transverse veins at apices of ulnar areas, and one at the apex of each longitudinal vein to apical areas.

Head, pronotum, and mesonotum granulose; rostrum reaching the posterior coxæ; tympanal coverings prominent and finely transversely striate; abdomen finely pilose; opercula rounded, not extending beyond the anterior margin of the first abdominal segment; tegmina only a little longer than the body.

Long., excl. tegm., 14 mm.; exp. tegm. 39 mm.

Hab. S.W. Australia (*Higgins*).

Allied to *H. fullo*, Walk.

BIBLIOGRAPHICAL NOTICES.

Fasciculi Malayensis: *Zoology.* Part II. 1903. Longmans, Green, & Co.

The value of the work accomplished by Messrs. Annandale and Robinson during their expedition to Perak and the Siamese Malay States in 1901–2 may be measured by the admirable series of memoirs thereon which are now passing through the press.

The second part, dealing with the zoological results of the expedition, embraces papers on the non-operculate Mollusca; Rhynchota; Coleoptera; and the structure and mechanism of the funnel surrounding the mouth of the tadpole of *Megalophrys montana*; Marine and Freshwater Fishes; and a tooth of *Elephas namadicus*.

The bulk of these papers are of a purely technical character. The most interesting perhaps is that on the marine fishes, inasmuch as it embraces some curious facts concerning the justly celebrated "walking-fishes," *Periophthalmus* and *Boleophthalmus*.

A newly discovered species of the first-named genus, *P. phya*, proves to be remarkable in more ways than one, but chiefly on account of the fact that it constructs a more or less permanent burrow, used either as a refuge when threatened or as a shelter in bad weather; it may possibly also serve as a nest, but about this there is some doubt.

The main entrance to this burrow lies in a pool of water, which is maintained when the tide sinks (for it is always made between tide-marks) by a rampart of mud some 5 or 6 inches high and a foot and a half in diameter. Outside this rampart a number of small holes are always found, and these lead into the central shaft. When alarmed the fishes dive at once into one of the outer shafts or else mount the rampart, and after a careful survey either pitch headlong into the central pool or resume their hunting.

It would have been well if more accounts of this kind had been included in the volume; as a rule, however, little more than a list of species of each of the groups collected has been given.

The two coloured plates of Rhynchota certainly represent the acme of the three-colour process and are really splendidly rendered.

The third part of this volume will, we believe, be published shortly.

Trouessart's 'Catalogue of Mammals.'

Catalogus Mammalium, tam Viventium quam Fossilium. By E. L. Trouessart. Quinquennale Supplementum, Fasciculus i. Berlin: Friedländer & Son, 1904. Pp. iv + 288. Price 12*s.*

The papers on Mammalia which have been published in the columns of the 'Annals' during the last few years are alone sufficient to serve as an indication of the great progress which has been made in the detailed study of that group, and the numerous changes in nomenclature which have been advocated, during the period in question. Any systematic work on Mammals published

half a dozen years or so ago is indeed, if all these proposed changes be adopted, practically obsolete, while all lists of species of that date are hopelessly in arrears. In these circumstances, it is very satisfactory to find that Dr. Trouessart has been enabled to bring his invaluable 'Catalogue' up to date by the issue of what he calls a supplement. As a matter of fact, this is practically a new edition of that work, with the exception that the original references to genera and species which retain their old titles are not repeated, the student being referred back to the second edition of the 'Catalogue' itself. In some respects this plan is a decided disadvantage, since it renders it necessary for every student to have access to the original work, which in due course will probably be out of print, whereas if references to the place of publication of genera and species had been given in the supplement, the latter would have sufficed for all purposes. Doubtless, however, the large additional expense thus involved would have rendered this plan impracticable.

The present portion of the re-issue comprises the four orders Primates, Chiroptera, Insectivora, and Pinnipedia (expanded into six by the author); and an idea of the number of additions to the species in these groups since the date of the second edition of the 'Catalogue' may be gleaned from the statement that (apart from subspecies) the first of these now comprises 290 against 255. In cases where names are preoccupied or otherwise unavailable, the author has not hesitated to replace them by new ones; but in thus substituting *Leptocebus* for *Semnocebus*, we note that he has been anticipated by Mr. Palmer, who suggested *Lophocebus*. A name is regarded as preoccupied even when there is some difference in the mode of spelling or in the form of the termination, as in the case of *Megaloglossus* and *Megaloglossa*; and in this we think he is right. Whether, however, naturalists will agree with him in accepting all the emendations and changes that have recently been proposed in mammalian nomenclature (even when they have been suggested in our own columns) remains to be seen. Generic terms are for the most part employed in a wide sense, many of the so-called genera of modern zoology being relegated to subgeneric rank, as in the case of the more typical Bats, where we find *Pterygistes* and *Pipistrellus* regarded as groups of *Vespertilio*.

When complete, the 'Supplement' will be invaluable to naturalists; and we may wish the author health, strength, and energy to bring his laborious and self-imposed task to a satisfactory conclusion.—R. L.

International Catalogue of Scientific Literature. Second Annual Issue. R. *Bacteriology*. London: Harrison & Sons. 1903 (October). Price 21*s*.

This great catalogue should prove of considerable value to those engaged in research. The present volume (Bacteriology) is divided into two portions—the first an authors' catalogue, in which works and papers are catalogued under the names of the authors, alphabetically arranged; the second a subject catalogue, authors' names

again appearing alphabetically under each subject, and cross-references between the two portions of the book are also given.

Two criticisms of the work might be made. Beyond the statement that it is the second annual issue and the date of publication (1903), no indication is given of the period that is covered; presumably it is the year 1902. Secondly, in the subject catalogue it would be a great convenience if the subject dealt with were briefly indicated in headings to the pages. As it is, several pages may have to be turned over before arriving at the subject heading. It is true that the last objection is perhaps removed by an excellent index.

The Old Riddle and the Newest Answer. By John Gerard, S.J., F.L.S. London: Longmans, Green, & Co. 1904.

The object of this book is to show not only that Haeckel, in his 'Riddle of the Universe,' claimed more for the theory of evolution than is warranted by the facts—and no one doubts this,—but that this theory, when it comes to be closely and carefully examined, proves absolutely valueless as an explanation of the origin and development of life upon the earth. It is, in short, a thing vainly invented, and grounded upon no warranty!

That the author should have arrived at a conclusion so extraordinary in the face of the evidence before him is inexplicable.

The case for the prosecution is conducted with much skill. Huxley's evidence is made again and again to tell against the theory for which he worked so hard. The evidence in other cases is of very questionable value. What reliance, for example, can be placed on the opinion of an eminent botanist as touching the evolution of the horse?

Many times in the pages of this book the author has presented the evolution theory, or the Darwinian hypothesis of "natural selection," in a guise which shows clearly that he has failed to appreciate not only the significance of the facts involved, but also the essential principles of these hypotheses.

The argument for the evolution theory from the evidence of geographical distribution rests on a quotation from the 'North British Review' for 1867! The marvellous series of Proboscidean remains in the British Museum afford overwhelming testimony to the theory of evolution; and their evidence in this connexion was pointed out, only a few months ago, in a course of lectures by Prof. E. Ray Lankester. The author makes but a passing reference to these, and then passes immediately afterwards, without further comment, to discuss the views of Gaudry on the Mastodon and Dinotheria!

Of the Proboscidea the author, in an earlier part of his book, says:—"These, like other families, to judge from the evidence we have, began with the biggest representatives" Surely the word "biggest" should read "smallest"!

But we have said enough. We close this volume with a sense of disappointment and regret. The author seems to have undertaken this task with the conviction that the theory of evolution must be

discredited at all costs, as subversive alike of religion and of morals; and in accordance with this view he has had recourse to desperate measures, which are to be deplored—the more so since they are unnecessary, for the truth can hurt neither if they themselves are true.

We say, without fear of contradiction, that the theory of evolution is unassailable. It is as well founded as the law of gravitation, as irresistible as the proof of the rotundity of the earth—and there are some who doubt this last fact, even in these days!

W. P. Pycraft.

Forest Conditions of the San Francisco Mountains Forest Reserve, Arizona. By J. E. Leiberg, Th. F. Rixon, and A. Dodwell. With Introduction by F. G. Plummer. Series H, no. 7. Pages 95, with seven maps and plates. 4to. Government Printing Office, Washington. 1904.

Forest Conditions in the Black Mesa Forest Reserve, Arizona. Prepared by F. G. Plummer from Notes by Th. F. Rixon and A. Dodwell. Series H, no. 8. Pages 62, with seven maps and plates. 4to. Government Printing Office, Washington. 1904.

The forest-conditions of definite regions in the United States are especially described and illustrated in several papers ("Series H. Forestry") of the U.S. Geological Survey Annual Reports and in seven separate memoirs (1902–4). The noted details are clearly and fully described, and good plates of maps, plans, views of mountain and prairie, of forests, woods, isolated timber-trees, and "stands" of special trees are abundantly supplied.

After having defined the limits of the area to be noticed, the authors give an account of its superficial features, its soil, drainage, water-supply, agricultural and mining aspects, if any. The timber is then considered, 1st, as to the kinds of trees (in memoir "H 7" 12 conifers are enumerated and 10 broad-leaved species; in "H 8," 9 and 6 respectively); and, 2nd, the zones they occupy in the area, variable according to height and exposure to favourable conditions or otherwise. Also as to the estimated quantity and commercial value of the timber which the best sorts of the trees may supply, and the quantity of fuel the poor kinds may furnish.

The description of the several kinds of trees follows, as to their general habit and style of growth, their merchantable condition, and the calculable value of forest-zone and timber-belt for fuel, fencing material, and mill-timber (some is used largely for railways and mines). Some notes are also given about the deciduous or broad-leaved trees and their relative value in different ways.

Of course, the forests have been destroyed by the axe to a great extent; but, besides cutting, other agencies of destruction have been the following:—grazing, mainly flocks of sheep trampling and eating the seedlings, and fire from hunters' and shepherds' camps, railway sparks, and especially lightning.

At page 17 of "H, no. 7" it is stated:—"Among the coniferous species the yellow-pine claims first rank, constituting over 99 per cent. of the merchantable timber and about 90 per cent. of the total

forest. It is followed by one-seed juniper and piñon. The other coniferous trees form individually but small percentages of the total growth, and are confined to more or less circumscribed tracts. Among the broad-leafed species, aspen takes first rank, but is closely followed by the oaks. The rest of the species of this class consists of isolated trees or small groups scattered on the breaks to the larger canyons."

And at page 18 of the same no. 7 Forestry memoir:—"The aborescent growth in the Reserve falls naturally into three chief types or divisions, with one which is intermediate or transitional. These types in their altitudinal extensions, and in the species which correspond in a general way to the different ratios of precipitation which prevail over the various districts in which they are found. Yet here, as elsewhere, the soil-moisture, not always closely proportioned to the annual precipitation, comes into play, and limits the range of the different types, or extends it into areas where otherwise they would not occur."

At pages 30 and 31 of "no. 8" both the natural retention and the "run-off" of rain-water in a forested area are carefully considered, with true scientific application of the topographical evidences.

The Geology and Ore-deposits of the Bisbee Quadrangle, Arizona. By Frederick Leslie Ransome. 168 pages. 4to. With 29 plates and 5 text-figs. Government Printing Office, Washington, 1904.

This memoir is the "21st Professional Paper" of the United States Geological Survey, and, as usual with that series, contains a trustworthy and complete description of a definite region as to its production of materials useful for arts and manufactures, and its surface-features, geological structure, and its palæontology, all carefully observed, noted, and illustrated by members of the Survey, under the superintendence of the Director, C. D. Walcott. The volume before us treats of an important copper district in Arizona, the territory lying south of Utah, near the mouth of the great Colorado River, and forming part of one of the great metalliferous regions of N.W. America. The strata of the country belong to the Precambrian, Cambrian, Devonian, Carboniferous, and Cretaceous formations, and there are superficial beds of Quaternary age. Some of the older strata have been more or less metamorphosed by contact with the intrusive granite and granite-porphyry of post-Carboniferous date. There are also dykes of later date and less importance, probably doleritic, but much altered.

This work, by Mr. F. L. Ransome and his colleagues, is richly illustrated with good geological maps, views, and sections, and with characteristic fossils, also plans and details of mining. The distribution, the genesis, and condition of the ores, both of primary and secondary origin, are considered, the latter having been enriched by the natural leaching of copper-salts from the pyrites lying at a higher level. The limonite and kaolin, met with in local abundance,

are also noticed. The progress of mining work in the Bisbee Quadrangle from about 1873 to 1899 is given as having been productive of about 380,113,851 pounds of "black" (crude) copper.

The lucid and scientific descriptions of local features, facts, and conditions render this volume a valuable adjunct to mining literature, and its value is enhanced by a somewhat sanguine but quite cautious treatment of the probabilities of good pyrites being found at certain localities and levels in neighbouring rock-formations.

PROCEEDINGS OF LEARNED SOCIETIES.

GEOLOGICAL SOCIETY.

June 22nd, 1904.—J. E. Marr, Sc.D., F.R.S., President, in the Chair.

The following communication was read:—

'The Tertiary Fossils of Somaliland, as represented in the British Museum (Natural Museum).' By Richard Bullen Newton, Esq., F.G.S.

Since the publication, in 1900, of Prof. Gregory's paper, founded on specimens in the Natural History Museum, mostly collected and presented by Mrs. Lort Phillips, the National Collection has been enriched by further series of fossils: the Donaldson-Smith Collection, and one presented by Major R. G. Edwards Leckie. The new material is, generally speaking, better preserved than that previously dealt with. The large Lucinidæ and specimens of *Campanile* (previously considered as *Nerinæa*) are very typical of Eocene rocks generally, and they agree with the foraminifera in the Somaliland Limestones in supporting the reference of these rocks to this period. The matrices of these limestones correspond with those surrounding the corals described by Prof. Gregory as belonging to the Uradu and Dobar Limestones. Two limestones seem to be represented in the collections—an upper, massive and cherty, often coloured reddish-brown externally; and a lower, of less cherty character and lighter colour. The limestones appear to be capable of correlation with those of the south-eastern corner of Arabia, as well as with those of Sind and Cutch; they can also be traced in connection with the Eocene areas of Egypt and other regions of North Africa, through Europe to the Paris Basin, and so to the Bracklesham Beds of England. The new collections contain some older fossils, but they are not considered in the present paper.

A review of the literature of the subject is given, and the Author then proceeds to the description of species of gasteropods, lamellibranchs, echinoids, and corals. Six new species are described and named, and sixteen species or varieties described but not named. An account of the foraminiferal structures of the limestones follows, and the paper closes with a list of the known Tertiary fossils from Somaliland.

MISCELLANEOUS.

On the Mineralogical Structure of the Porcellanous Foraminifera.

To the Editors of the 'Annals and Magazine of Natural History.'

Gentlemen,—In Mr. J. J. Lister's work on the Foraminifera ('Treatise on Zoology,' pt. i.), a copy of which I have only just seen, that author has put a misconstruction on my statements regarding the probable mineralogical structure of the porcellanous Foraminifera. On p. 54 he says, "Chapman also has recently stated that the tests of the Miliolidea are of aragonite, or, rather (following Miss Kelly, 'Mineralogical Magazine,' vol. xii. (1900) p. 363), conchite. I am inclined to doubt this conclusion." If Mr. Lister will kindly turn to p. 39 of my work on the Foraminifera, he will there read, "The mineral constituent of this type has long been supposed to be carbonate of lime in the form of aragonite. This appears from recent researches and from the author's own experiments to be extremely doubtful, and is more likely to be an intermediate mineral condition in which the organic element is intimately mixed with the mineral, and probably corresponding with the new mineral species Conchite. One powerful argument against the view that the porcellanous shell is composed of aragonite, which is a very unstable mineral, is the fact that certain calcareo-argillaceous rocks of Carbo-Permian age from Australia have recently been described which are largely made up of the tests of a wild-growing or meandering form of *Nubecularia* in which the shell-texture is exactly comparable with that of the recent porcellanous forms of the genus."

Incidentally I may mention that the optical phenomena exhibited by thin slices of porcellanous Foraminifera are not in favour of their being formed of calcite, as Mr. Lister supposes, as I have repeatedly observed traces of anomalous biaxial figures under convergent polarized light.

Frederick Chapman.

National Museum, Melbourne, Australia.
August 16th, 1904.

The Limacodid Lepidoptera and their Dipterous Parasites, Bombylides of the Genus Systropus: *Parallel Adaptation of Host and Parasite to the same Conditions of Existence.* By J. Künckel d'Herculais.

In the course of the mission which I have fulfilled in the Argentine Republic (1898–1900) I had an opportunity of observing the singular organic likeness between the Lepidopterous host and

its Dipterous parasite, and of recognizing the physiological consequences resulting from this likeness in acts of the same nature which both have to perform.

In order to bring out the originality of the biological phenomena of which I have been witness it will be well to give a brief historical sketch. Benj. D. Walsh, in 1864, was the first to discover, in the United States, that certain Diptera of the family Bombylidæ (*Systropus*) were parasitic upon Limacodid Lepidoptera. This observation, superficial though it was, is none the less interesting, inasmuch as at that time the Bombylidæ were regarded as exclusively parasites of Hymenoptera; we know nowadays that their field of action is far more extended. Westwood (1876), having received from Natal Limacodid cocoons from which a *Systropus* had emerged, was able to verify the correctness of the preceding observation and complete it with the assistance of figures. He remarked that the head of the nymph exhibited "a strong conical frontal projection, by means of which it is without doubt capable of pushing back the operculum at the extremity of the Lepidopterous cocoon"; having before him, however, dried specimens, he had no suspicion of the ingenious process employed to enable the nymph to quit its prison. Carlos Berg simply mentions (1878) that *Systropus* frequently issued from the cocoons of Limacodid Lepidoptera (*Sibine*, nec *Streblota*, de Berg, *bonaërensis*, Berg). Lastly, Dr. T. A. Chapman (1902), having received from La Plata the cocoon of an *unknown* Limacodid, accompanied by the exuviæ of a *Systropus*, *also unknown*, supposed, after an examination of the head of the Lepidopterous chrysalis and that of the nymph of the Dipterous parasite, and after comparison with the figures given by Westwood, that both were capable, not, as the English author supposed, of lifting up a pre-existent operculum, but of making for themselves the opening by which the adult insects escaped. These were nothing more than conjectures; observations on the living subject could alone determine whether they had any foundation in fact.

This being the question, the following observations were made by the author. In the autumn, that is to say in the month of June, the cocoons of *Sibine bonaërensis* are not infrequent on fruit-trees, and especially pear-trees, in the gardens of country houses (*quintas*) near Buenos Ayres; if the cocoons are opened during the winter months two conditions present themselves: in the first the Lepidopterous caterpillar is found contracted and immobile, and so it will remain until the fine weather, when it will be suddenly transformed into a chrysalis, the imago emerging eight to ten days later; in the second case its place is taken by the larva of the Dipterous parasite, also contracted and immobile, remaining in this state also until the hot season, when it is changed into a nymph, becoming adult a few days later. The larvæ of the host and of the parasite are thus both in that state of somnolence which I have called "*hypnodie*"; on the other hand, the chrysalis of the former and the nymph of the latter are both active and capable of developing

the most extraordinary energy in order to escape from their prison.

It is necessary first to make the observation that the caterpillars of *Sibine bonaërensis*, like those of other Limacodidæ, as the study of their cocoons has taught, provide no operculum to facilitate the emergence of the imago; these cocoons are shells, of which the parchment-like tissue is homogeneous. It follows therefore that these insects, whether host or parasite, must have some special means of making an outlet. To this end both chrysalis and nymph are armed on the frontal region with a strongly chitinized conical point, absolutely similar in the two cases. Both carry points at the extremity of the abdomen. Host and parasite, thus armed, bend themselves like a bow, then give to their bodies rapid and violent gyratory movements, at the same time pressing the frontal point against the anterior end of the cocoon, and in this way they cut out a hemispherical cap with sharply defined borders of a size proportional to their own. We have here a phenomenon of convergence which the author thinks should be designated *homœopraxis* (ὅμοιος = like, πραξις = action).

Observation teaches what is the physiological mechanism which allows the prisoners to exert a maximum of energy and to convert themselves into a living brace and bit. The nymph of *Systropus* and the adult insect itself emerging from the nymph have a volume such that they present the appearance of *Anthrax* and *Bombylus*. It is only after emergence that the adult *Systropus* takes on its slender form and shows itself under the deceitful guise of a *Conops*. In short, the nymph possesses the faculty of filling its digestive tube with air, which enables it, under the action of the muscles, to compress the blood-mass which fills its general cavity. It has at disposal then an air-pump, like many other insects, which, as the author has already shown in the Orthopterous Acrideæ ('Comptes Rendus,' t. cx. 1890, p. 807, and t. xix. 1894, p. 244), plays so important a *rôle* after emergence, metamorphosis, and oviposition; the augmentation of volume which the insects present at the moment of emergence depends on the dilatation of the digestive tube with air, and not on the dilatation of the tubular or ampulliform tracheæ *.—*Comptes Rendus*, tome cxxxviii. no. 25, pp. 1623–1625 (20th June, 1904).

* The *Systropus* parasite of *Sibine bonaërensis*, Berg, a special species which ought to bear the name of *Systropus conopoïdes*, Künckel, differs from *S. fœnoïdes*, Westwood, from Mexico, by definite characters:—1. The two lateral spots on the metathoracic scutum are joined in one and of a straw-yellow; 2. The abdomen has the swelling at the extremity entirely black and the sides of the constricted portion marked by elongated black spots, forming a discontinuous lateral band; 3. The second tarsal articulation, both anterior and intermediate, is entirely black.

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[SEVENTH SERIES.]

No. 83. NOVEMBER 1904.

XLV.—*The Cape Colony Quaggas.* By R. I. Pocock, Superintendent of the Zoological Society's Gardens, late Assistant in the Zoological Department of the British Museum.

[Plates IX. & X.]

I. Introduction.

In an interesting and suggestive paper in the P. Z. S. for this year (vol. i. pp. 426–431), Mr. Lydekker discusses the presence of a preorbital pit in the skulls of recent horses, and incidentally attempts to establish two conclusions: (1) that all the genuine Quaggas known to us either from skins or photographs or figures, with the possible exception of the example at Vienna, are subspecifically identical, the admittedly great differences between some of the types being due either to individual variation or to fading from exposure to light or to carelessness in drawing; (2) that the species they constitute differs specifically from all the forms of the animal commonly known as Burchell's Zebra. These, presumably, are the views of the older generation of naturalists, to which Mr. Lydekker has reverted. But since I have long been of a different opinion on both these points, I avail myself of the opportunity afforded by the publication of Mr. Lydekker's paper to state at greater length

than heretofore the reasons upon which my opinions are founded; and I do this the more readily because it seems to me that the data upon which Mr. Lydekker relies are demonstrably unsound or open to certain obvious and cogent criticisms, which leave the questions at issue practically in *statu quo ante*, unless, indeed, they may be claimed as strengthened on my side by the refutation of the first authoritative adverse arguments that have been levelled against my beliefs. Also it may help to elucidate the difficulties besetting the determination of what are called the "true Quaggas," if an attempt is made to point out the salient characteristics of the principal types which commonly pass under that name. Two of these, of which specimens have luckily been preserved, were, a year or two back, regarded by Mr. Lydekker himself as worthy of nominal subspecific distinction. To these the evidence compels me to add a third, which, although unfortunately, like the first described form, known only from figures and descriptions, is yet the best-marked type of the four and the one that is perhaps the most interesting in the matter of coloration to students of the equine family. Current descriptions of "the Quagga" have been drawn mainly from these four sources to the creation and fostering of forgetfulness of the characters of the original type.

II. The two Characters alleged to be distinctive of the "Quaggas" as compared with the "Burchell's Zebras."

(1) It is stated by Mr. Lydekker that the pattern on the forehead in *Equus quagga* forms a shorter and more regular diamond than in the Bonte Quagga (*E. Burchelli*), and that in the former the centre of the diamond is a pale stripe with four or five dark stripes on each side of it, whereas in all Bonte Quaggas or Burchell's Zebras the diamond is made up of from five to nine stripes, the middle line being black, with from two to four stripes on each side. This proposition is not in all cases true either of the "Quaggas" or the "Burchell's Zebras." In his very accurate description of the quagga in the Vienna Museum (P. Z. S. 1902, vol. i. p. 35), Dr. Lorenz says: "Eight narrow lines [*i. e.* dark stripes] run from between the eyes down to the back of the nose and up to the beginning of the mane; *from the middle of the front a ninth medial line runs to the back of the nose.*" This quagga, therefore, differs in this particular from the one in the British Museum. So far also as the Burchell's Zebras

are concerned, the following observations, based mostly upon a few living and stuffed animals, show that no value is to be attached to the presence or absence of a median fronto-nasal black stripe :—

1. *Equus quagga Burchelli* (in B.M.).—On the forehead there are three pairs of black stripes and one median black stripe. On the nose the latter is double. *Hence the centre of the diamond is in its upper portion a dark stripe, in its lower portion a pale stripe.*

2. *E. quagga Wahlbergi* (type stuffed in B.M.).—Three pairs of symmetrically disposed stripes on the forehead. On the nose the inner or admedian stripe on each side bifurcates, giving rise to four pairs of stripes. *Diamond with pale median line throughout its length.*

3. *E. quagga Chapmanni* (in Zool. Gdns.).—Four pairs of symmetrical stripes on forehead, the second and third from the outside fusing below the level of the eye. One median black stripe on forehead confluent above with the fourth on the right side, but splitting below the eyes and turning aside towards the left out of the middle line. *Thus the centre of the diamond is a dark stripe on the forehead, a pale stripe on the nose.*

4. *E. quagga Chapmanni* (Prof. Ewart's "Matoppo").—Forehead with three pairs of symmetrical stripes and the middle line pale. The second stripe on each side was divided inferiorly and its inner branch again divided on the left side, the nasal portion of the diamond consisting of nine stripes. *Hence the middle line of the diamond on the forehead was pale, on the nose black.*

5. *E. quagga Granti* (in B.M., from Lake Baringo).—Two pairs of symmetrical black stripes and *a single median black stripe*, making five in all. These stripes, however, show signs of reduplication which if completed would convert them into ten stripes, leaving the median line pale.

6. *E. quagga Granti* (in B. M., from Kilimanjaro).—Three pairs of black stripes *and a median black stripe.*

7. *E. quagga Granti* (in Zool. Gardens, from Kilimanjaro).—Three pairs of symmetrical stripes on forehead and nose, but the admedian on the right side

giving off a short branch between the eyes. The centre of the diamond might thus be described as consisting of a pale stripe above and below, and a black stripe in the middle where the symmetry is broken by the supernumerary branch. But in reality *the pale median line traverses the diamond from end to end.*

8. *E. quagga Selousi* (type in B. M.).—Two pairs of symmetrical black stripes and *a single short isolated black stripe in the middle.*

These facts prove that amongst the Burchell's or Bonte Quaggas the central line of the facial diamond may be either pale throughout or dark throughout, or dark on the forehead and pale on the nose, or pale on the forehead and dark on the nose, or pale in its upper and lower extremities and dark in the middle.

The animals above described were not in any way selected to prove or disprove a case. They were the first that came to hand when I wished to verify, in the readiest manner possible, the statement as to the colour of the central line of the diamond. The arrangement of the bars is sometimes quite simple, sometimes very complicated and requiring the greatest care to follow out with accuracy. Nevertheless, an attempt at symmetry is generally traceable, although the actual middle line of the diamond may not lie in the middle line of the face.

The explanation of the facts given above is, I believe, as follows:—

The forehead and nose were originally furnished with a large number of symmetrically disposed stripes, the median line therefore being pale. By fusion these stripes are reduced in number. When the fusion is regular the symmetry is retained; when irregular it is destroyed. When a dark stripe occurs in the middle line it may result from the fusion of the two original admedian stripes. This, I understand, is substantially Prof. Cossar Ewart's opinion. The bifurcation of the stripes, however, may also be explained on the hypothesis of the splitting of originally single broader stripes. In that case there may have been a median stripe on the forehead and head comparable to the spinal stripe in the middle of the back. But in any case I am persuaded that it is impossible to make the presence or absence of a dark median line a basis for splitting the Quaggine from the Burchelline species of *Equus*.

(2) Mr. Lydekker also believes the "Quaggas" may be

distinguished from "Burchell's Zebras," using this term in its broadest sense to include such diverse forms as Grant's, Crawshay's, Chapman's, and the typical Burchell's, by the presence on the skull in front of the orbit of a depression, claimed to be the remains of a pit which in more archaic forms lodged a facial gland. Evidence of the existence of this depression in a quagga's skull was pointed out by Dr. Forsyth Major in 1880. It is also present, as Mr. Lydekker has shown, in the skull of the animal in the British Museum. This confirmation of Dr. Major's observation would, to a certain extent, justify a provisional generalization as to its occurrence in all "true Quaggas'" skulls, were it not that this pit belongs to the category of characters which are likely to appear sporadically as atavisms, and are, therefore, from the systematic standpoint, open to suspicion on the score of inconstancy. Such characters are of doubtful value as a basis for the formation of natural groups, for functionless vestiges have seldom much importance in taxonomy. This is the principal argument to be alleged *à priori* against the belief in the specific value of the depression in question. On *à posteriori* grounds I also find reasons for rejecting that belief.

Mr. Lydekker asserts that he found no trace of the depression in any of the Burchell or Bonte Quaggas' skulls, of which there are, he adds, a good number in the British Museum. I cannot find in that institution any skull known to be that of a typical Burchell. There are the skulls of *E. quagga Wahlbergi*; of two subspecifically unknown specimens received from the Zoological Society; of two labelled Crawshay's Quagga which were collected by Penrice and are therefore probably referable to *E. quagga Chapmanni*; and of three examples of Grant's Quagga, one (♀) obtained by Gregory, and two (♂ ♀) by Hinde on the Athi Plains. Presumably, these are the skulls that Mr. Lydekker refers to comprehensively as those of Bonte Quaggas'; but they hardly justify the conclusion that the facial pit was absent in the typical Burchell. They do, however, satisfy me that no great reliance can be placed on the character under discussion; for, although the skulls of the female Grant's Quaggas have practically no trace of the depression, it is very perceptible both to eye and touch in the skull of the stallion. It is certainly shallower than in the skull of the type of Grey's Quagga, which is also, by the way, that of a stallion; but it is quite unmistakably present, and supplies, so far as it goes, an almost exact mean between the skull of Grey's Quagga, on the one hand, and the remaining

skulls of Grant's, Chapman's, and Wahlberg's Quaggas, which are devoid of it, on the other.

III. The Races of Cape Colony Quaggas.

Edwards's Quagga.

Equus quagga, Gmelin. (Pl. IX.)

(Typical subspecies.)

The Female Zebra, Edwards, Gleanings, v. ch. 13, p. 29, pl. 223 (1758) (type).
Equus quagga, Gmelin, Syst. Nat. i. Mammalia, p. 213 (1788).

The original description of this animal runs as follows:—"For size and shape it is much like the last described [*E. zebra*]. To speak of its general colour (exclusive of its stripes, which are all black), the head, neck, upper part of the body, and thighs are of a bright bay-colour; its belly, legs, and the end of the tail are white. On the joints of the legs it had such corns as we see in horses; the hoofs are blackish; the head is striped a little different from the last described [*E. zebra*]; the mane is black and white; the ears are of a bay colour; it is a little white in the forehead; it hath several broad stripes round the neck, which become narrow on its under side: it hath a black list [stripe] along the ridge of the back and part of the tail, and another along the middle of the belly: the stripes on the body proceed from the list on the back and some of them end in forks on the sides of the belly, others in single points, and these have some longish spots between them. The hinder part of the body is spotted in a more confused irregular manner. The two sides of this, as well as the last described, were marked very uniformly."

One or two additional points not mentioned in the description, but shown by the figure, are sufficiently interesting to record. The muzzle is blackish grey to about the same extent as in Burchell's Quagga. The facial diamond consists of three pairs of stripes (not four pairs, as stated by Mr. Lydekker), the two admedians uniting at their ends to form a long oval. Nine stripes are represented as passing from the mane across the neck. Close to the mane these are as broad as the interspaces, but towards the throat they become very narrow, the three nearest to the head failing to reach the middle line. None of the neck-stripes shows a sign of reduplication or fusion, and there is no trace of a

shadow-stripe except close to the head. Behind the shoulder-stripe, which is very thick and trifurcate, there are five vertical stripes, and behind the fifth a set of larger and smaller black blotches resolvable inferiorly into about four stripes and into perhaps twice that number on the summit of the hind-quarters. Only the distal half of the tail is furnished with long hairs.

On the plate is the following legend:—"*Zebra femina, sive asina sylvestris africana. Drawn from the living animal belonging to His Royal Highness the Prince of Wales.*"

Daniell's Quagga.

Subsp. *Danielli*, nov. (Pl. X.)

The Quahkah, Daniell's African Scenery, no. 15 (1804–1808) (type, stated to be drawn from life).

Equus quagga, Cornwallis Harris, Portraits of Game, &c., from Southern Africa, 1840, pl. 2 (stated to be drawn from life).

? *Hippotigris quacha*, Hamilton Smith, Nat. Library, vol. xx. Horses, p. 330 (1841) (stated to be drawn from life in Table of Contents).

Description of type.—Head, neck, upper part of shoulder and of hind-quarters chestnut. Head narrowly striped; muzzle black. Neck striped; the stripes sepia-brown, much narrower than the intervening areas, tapering and wavy inferiorly and sometimes bifurcating, but falling short of the middle line of the throat. Mane white, its stripes narrow, about thirteen in number from behind the ear. A few stripes on the withers like those on the neck and not reaching half-way down on the shoulder. Behind the withers there are also a few similar short stripes; but the posterior half of the body and the hind-quarters are neither striped nor spotted. Between the principal stripes on the neck and withers there are here and there a few narrow detached stripes. The lower half of the shoulder, of the body, and of the hind-quarters white. Legs also white, with a narrow dark rim above the hoof and a dark tuft on the back of the fetlock. Tail white, equine; the long hairs extending to the root.

Daniell's figure is accompanied by the following letter-press:—"This species of Wild Horse which the Hottentots call Quahkah, is one of the most common and abundant of the larger animals that are met with on the barren plains of Southern Africa. It is generally found in numerous herds that are mostly accompanied by a few harte-beests and ostriches. They are tolerably swift; but the boors sometimes succeed by stratagem to take them alive by throwing the noose of a rope over their heads. By domestication it soon becomes mild and tractable, and might be rendered

extremely useful by patient training; yet abundant as they are in the country, there are few instances of their being put to harness. They are stronger than the mule, live hardily, and are never out of flesh. They are variously marked; some with waved stripes on the neck only, others with bands across the shoulder, others marked on the haunches, somewhat like the Zebra, which gave rise to an idea that was long entertained of its being the female of that animal; from which, however, it differs in almost every particular, except in the stripes, being in its shape infinitely more beautiful. The large head, the long ears, and the slender legs of the Zebra partake very much of the character of the common ass. The mane of the Quahkah is curious, appearing as if trimmed by art. This animal is found on all the plains behind the first range of mountains beyond the Cape Peninsula."

This passage, written twenty years before the description of *E. Burchelli* was published, and at a time when, apart from vague pre-Linnæan records, only two species of striped African horses were known in Europe—namely *E. zebra*, Linn., and *E. quagga*, Gmelin,—shows that Daniell was acquainted with certain equine forms resembling, if not identical with, some of the known subspecies of Burchell's Quagga in markings, form, and habitat. It is significant that with an artist's eye he regarded them all as "Quahkahs."

That Daniell was familiar with Cape Colony as far north as the Orange River, and at least as far east as Algoa Bay and Caffraria, is established by the letterpress and plates of his volume. He also visited Bechuanaland, where no doubt he met with the typical form of *Burchelli* and possibly also with *E. antiquorum* *.

The Quagga figured by Cornwallis Harris so closely resembles the one figured by Daniell as to need no description. Hamilton Smith's illustration, however, depicts

* According to the 'Dict. National Biography,' Samuel Daniell joined a mission for exploring Bechuanaland in 1801, in the capacity of Secretary and draughtsman; and in the preface to 'Sketches representing the Nature, Tribes, Animals, and Scenery of Southern Africa from drawings made by the late Samuel Daniell,' 1820, William Daniell, his brother, says of him: "In order to extend the field of his research he went to the Cape of Good Hope, from whence he accompanied Dr. Somerville on two expeditions into the interior of the country It was his constant care to see the animals alive, that he might make himself master of their actions and habits." With this information, so strong in confirmation of the evidence supplied by his own work, it is impossible to doubt that Daniell's statements were based upon actual experience and his figures derived from personal observation.

an animal differing in certain features from the other two. The forelock is equine and the tail asinine, the long hairs being confined to its terminal half. Moreover, the stripes on the neck are less sinuous and the narrow detached stripes absent. The chestnut tint extends considerably lower on the shoulder and fore part of the body, and the shoulder-stripe is correspondingly longer. In the hairiness of the tail and the straighter neck-stripes, this form exhibits an intermediate stage between Edwards's Quagga (*E. quagga quagga*) and Daniell's Quagga (*E. quagga Danielli*)—a gradation which, it may be assumed, was exemplified by living animals, if the hypothesis of the former existence of intermediate types between the various forms of S. African quaggas is founded on fact.

With some reservation in favour of Hamilton Smith's figure, the figures quoted in the above-given synonymy represent, I believe, specimens of one and the same form of quagga, which, according to the characters depicted, differs in my opinion more from the quaggas called *Greyi* and *Lorenzi* than the latter do from *Burchelli*. It appears impossible to explain away these differences, as Mr. Lydekker would do, on the plea of carelessness in the execution of the drawings. Three cogent reasons may be advanced against such a view. First, the drawings are distinctly stated to have been taken from living specimens; and this statement, which must be accepted as true, disposes of the objection that Harris and Smith may have copied Daniell or that Smith copied Harris. Second, it is almost incredible that these artists erred independently in the same direction. Third, the rest of the drawings in the three respective volumes are on the whole so good, often indeed so excellent and so full of life, that it is again incredible that the artists can have blundered in the case of the quaggas to the extent necessary for the establishment of Mr. Lydekker's hypothesis. Moreover, in Daniell's drawing there are certain details, like the whiteness of the mane, the presence of a tuft of black hair on the fetlock, and of a black rim above the hoof, which attest care and power of observation on the part of the artist incompatible with carelessness in the copying of the stripes on the neck and omitting them from the body, if the animal before him had resembled the typical quagga.

Again, it is significant that Cornwallis Harris, as Mr. Lydekker astutely detected, worded the legend to the figure of the quagga's skin attached as tailpiece to his description of this species, "Head and Skin of the Animal exhibited as a Quagga at the Zoological Gardens, Regent's Park." This may be interpreted as indicating a doubt in his mind as to

the correctness of the determination of the Society's specimen. One need only compare the two illustrations, both taken by the same artist from actual specimens, to find ample justification for any dubiety on the point that may have been felt.

Lorenz's Quagga.

Subsp. *Lorenzi*, Lydd.

Equus quagga, Lorenz, P. Z. S. 1902, vol. i. pp. 32–38, fig. 7.
Equus quagga Lorenzi, Lydekker, Knowledge, xxv. p. 221 (1902).

Nose clay-coloured (?), between the nostrils dark brown; chin and throat chestnut. Stripes on the sides of the head clay-brown (?=reddish brown), and very broad as compared with the narrow linear cream-coloured interspaces. Neck with eight very broad yellowish-brown stripes passing from the mane to the middle line of the throat, those lying towards the head and shoulder narrower than the rest; these stripes are entire, being undivided and are separated by relatively extremely narrow light creamy interspaces, which, broadly speaking, appear to be about one third the width of the stripes. Mane dark chestnut, with ten tufts of whitish hair at the sides.

In front of the shoulder-stripe run two narrower stripes to meet on the breast. The shoulder-stripe is broad and bifurcates inferiorly; in the angle thus formed there are about four transversely angular stripes. Behind the shoulder-stripe on the body there are seven distinct stripes, which become obsolete inferiorly where they bifurcate and become confluent with the buff colour of the adjacent interspaces. Of these stripes the first three have an extreme width of 8 or 10 cm., the width of the interspaces, which are sharply defined in their upper half, being from 1 to 1·5 cm. The fourth stripe, which seems to be double, sends a branch obliquely backwards to the croup and thus encloses a triangular area, of which the spinal stripe forms one side. Within this there is another broad longitudinal stripe anastomosing twice or thrice with the oblique one and with the spinal stripe. The triangles on both sides form a kind of saddle, as in Burchell's Zebras. The fifth and sixth bands run obliquely back over the haunches, both becoming gradually narrower at their upper ends and falling short of the spinal stripe. The seventh stripe, which is distinct, although narrow and twice interrupted, runs from the groin over the haunches towards the root of the tail. In front of it there is a short band, and behind on the back of the haunches three or four oblique and gradually fading stripes.

The breast, belly, legs, and tail are white, with the exception of the brown median ventral band; some black hairs on the back of the pastern and fetlocks and on the rim of the hoof. The tail is said to be furnished with elongated hairs from the root; but, judging from the photograph, the basal third is covered with short hairs.

This animal differs from *E. quagga Greyi* as exemplified by the specimens represented in York's photograph, and by those in the British and Amsterdam Museums, by the extreme narrowness of the interspaces between the stripes upon the head, neck, and shoulder, and by the sharpness of their definition upon the body, which enables the striping to be traced with certainty even back upon the hind-quarters. The regularity of the banding of the neck is also very noticeable.

From *E. quagga quagga* it differs by having the interspaces narrow and cream-coloured, the stripes very broad and brown, and by the presence of stripes upon the posterior half of the body and on the hind-quarters.

I have given the description of this quagga somewhat fully because, in my opinion, it is the one of all others which proves by the arrangement of the stripes upon the posterior half of the body and hind-quarters that these animals are nothing but extreme forms of Burchell's Quagga, differing from the typical race of that animal not more—in some cases, indeed, in my opinion, less—than the latter differs from its more northern relatives, and thus justifying the view I have already published that, as species are at present reckoned in the equine group, the various races of Burchell must be regarded as subspecies of *E. quagga**.

Grey's Quagga.

Subsp. *Greyi*, Lydd.

Equus quagga Greyi, Lydekker, Knowledge, xxv. p. 221 (1902) (fig.).

This form seems to differ from *Lorenzi* in the following

* Vernacular names in zoology are of no great moment, except in so far as they are apt to fog the mind of the layman on the question of relationships. Tell him that *E. Grevyi*, *E. zebra*, and *E. Burchelli* are zebras, and that *E. Lorenzi* is a quagga, and he very naturally infers that the first three are closely related and the last a quite distinct form. To obviate this error in part I have proposed to extend the term "Quagga" to all the Burchelline Equidæ, and thus to bring the technical and vernacular terminology into accord; and I think that until it can be shown that there is a greater gulf between Lorenz's Quagga and Burchell's Quagga than there is between Burchell's and Grant's Quaggas, it is misleading to bracket the latter two as "Bonte Quaggas" and to restrict the term "Quagga" to the forms constituting the subject-matter of the present paper.

particulars:—The stripes on the head, neck, and shoulders (when present) narrow and separated by relatively wider interspaces. The neck irregularly banded, the stripes showing a tendency to split (in the British Museum and the Tring specimens), or fuse in pairs (in the Amsterdam specimen), or to be accompanied by shadow-stripes (as in the type in the British Museum). In the latter and the Tring specimen the creamy interspaces are discernible behind the withers for a short distance. In the Amsterdam specimen they stop short at the base of the neck. The posterior half of the body is at most confusedly banded, the stripes apparently losing their distinctness owing to their disintegration and fusion and to the evanescence of the interspaces, which have assumed the same colour as the stripes themselves. There is thus a sharp contrast between the coloration of the neck and that of the body. No stripes seem to be discernible upon the hind-quarters.

The following specimens are probably, I think, referable to this subspecies:—

1. The specimen in the Edinburgh Museum.
2. The specimen in the Amsterdam Museum, figured by Mr. Lydekker (P. Z. S. 1904, i. fig. 86, p. 430).
3. The specimen in the British Museum. This is the type of *E. quagga Greyi*, Lydd. It lived in the Zoological Society's menagerie from Sept. 4th, 1858, to June 10th, 1864, as recorded by Sclater (P. Z. S. 1901, vol. i. pt. 2, p. 166).
4. The specimen in the museum at Tring, which lived in the Zoological Society's menagerie from May 15th, 1851, to July 7th, 1872 (figured P. Z. S. 1901, i. pt. 2, p. 166, from life).
5. ?Specimen purchased by the Zoological Society, Nov. 5th, 1831, and mentioned in Waterhouse's Cat. of Mamm. p. 37 (1838), and by Sclater, P. Z. S. 1901, i. pt. 2, p. 165. This is, I suspect, the specimen from which was drawn the text-figure on p. 8 of Cornwallis Harris's 'Portraits of Game &c.,' 1840, which is stated to have been taken from a specimen exhibited in the Gardens.
6. ?Specimen belonging to Lord Morton, reproduced from a drawing by Agasse in Prof. Ewart's 'Penycuick Experiments,' p. 65 (1899).

Mr. Lydekker (*l. c.* p. 430), unless I misunderstand him, seeks to explain away the characters of this form as compared

with Edwards's and Lorenz's Quaggas by supposing that the original blackish-brown stripes all over the neck and body have faded to a brownish fawn, while the fawn intervals between the stripes have bleached to [creamy] white on the neck and retained their original colour approximately upon the rump, where the pigment of the interspaces was less susceptible to the action of light than upon the neck. I cannot find any reasons in favour of this explanation if the *à priori* assumption that all quaggas were originally coloured alike or nearly so be put on one side. There are, on the contrary, certain known facts so strongly opposed to it as to render its acceptance impossible without further evidence. In the first place, photographs may be trusted in matters of this kind; hence it is perfectly safe to maintain that if the living quagga photographed by York had been coloured like the specimen figured by Edwards, the dark stripes and paler interspaces upon the body and rump would have been shown exactly as they are shown upon the head, neck, and withers (see P. Z. S. 1901, i. p. 166). Surely this photograph proves conclusively that the specimen portrayed was *not* striped upon the barrel of the body and rump like the one depicted in Edwards's 'Gleanings,' but that these regions were at most indistinctly and confusedly banded, exactly like the specimens in the Amsterdam and British Museums. This conclusion is, I think, inescapable. Hence it follows that the difference in coloration between the neck and the body of the stuffed specimens mentioned above is not attributable to inequality in the fading of the two areas. It is, of course, probable that the skins in question have faded to a certain extent—to what extent we probably never shall know. So far as my memory serves, the Amsterdam specimen is of very much the same general tint as the specimen in the British Museum; yet the former died in 1883, and has presumably been exhibited for twenty years, whilst the latter died in 1864, and has probably been exhibited for forty years. Now the quagga of Edwards's 'Gleanings' with black stripes and bright bay interspaces very closely resembled in the matter of blackness of stripes a typical Burchell's Quagga or Wahlberg's race of that animal, and, without any evidence pointing the other way, it may be justifiably assumed that the pigment of the quagga described by Edwards was of the same nature—that is to say, as stable under the action of light—as the pigment of the skin of the type of *E. Wahlbergi*. The latter was received at the British Museum in 1846, and has presumably been exhibited for nearly sixty years. It is faded beyond doubt, but the fading has progressed uniformly all over the body, and, in spite of

the additional eighteen years' exposure to sunlight, is not in any sense comparable in extent to what must have taken place in the type of *E. quagga Greyi*, if the latter, as Mr. Lydekker thinks, also resembled the typical quagga in colour. Looking at the types of *Wahlbergi* and *Greyi* side by side, and bearing in mind the length of time the two have been exhibited in the public gallery at the British Museum, I find it impossible to attribute the present colour of the type of *Greyi* to extensive and unequal fading, and incredible that the body and neck were ever uniformly banded with black stripes separated by bay-, fawn-, or ochre-coloured interspaces of the same tone on the neck as on the body. A comparison between the type of *E. quagga Selousi* and the Amsterdam quagga, both of which date from 1883, enforces the same conclusion with regard to the last-named animal.

Finally, the specimen of the typical *E. Burchelli* in the Bristol Museum has been exhibited within my recollection for at least thirty years, and for a considerable portion of that time without even such protection as glass affords. It has thus been exposed to fading agencies for a much longer time than has the quagga in the Amsterdam Museum; yet the camera shows all the original stripes on the body and hind-quarters very clearly, as is attested by the photograph of the animal published in the Proc. Zool. Soc. 1903, ii. p. 197.

These facts prove that even after sixty years' exposure the stripes in quaggas of the Burchelline type remain sharply defined and fade merely from black to chocolate, and that the pigment of the interspaces upon the body and rump is as durable as that of the neck and head.

Mr. Lydekker's hypothesis, therefore, that the present coloration of the quaggas in the British and Amsterdam Museums is the result of forty and twenty years' exposure to fading influences acting upon skins formerly coloured like the quagga figured by Edwards, is discredited by what is known of the fading capacity of skins of specimens of various races of Burchell's Quagga exposed to similar influences for sixty, thirty, and twenty years respectively, and must, in my opinion, be regarded as entirely disproved by York's photograph of the living quagga, which shows an animal resembling the aforesaid stuffed examples in all respects essential to the argument.

For these reasons I resuscitate Mr. Lydekker's subspecies *E. quagga Greyi*.

The following table summarizes the characters of the four subspecies discussed above :—

a. Stripes on neck narrow, narrower than interspaces, not reaching middle line of throat; body with only a few short stripes behind withers, its posterior portion neither striped nor spotted *Danielli.*

*a*¹. Stripes on neck broad, as broad as interspaces, at least close to the mane, and extending to the middle line of the throat; body with more or less distinct long stripes behind the withers.

b. Stripes black, interspaces bright bay; neck-stripes thinning greatly towards middle line of throat; body with strongly marked black stripes, those on its hinder half broken up into spots *quagga.*

*b*¹. Stripes brown, interspaces, at least on neck, creamy yellow; body much less distinctly striped.

c. Stripes exceedingly wide, those on the neck entire, the interspaces forming distinct but very narrow lines on the head, neck, and at least the upper half of the body; stripes on the hind-quarters extending as far back and having the same direction as in *E. quagga Burchelli* *Lorenzi.*

*c*¹. Stripes narrower, those on the neck fused or interrupted, the interspaces forming moderately broad bands, except when interrupted by shadow-stripes; the interspaces on the body behind the shoulder almost as dark as the stripes, which are therefore scarcely distinguishable and do not extend on to the haunches *Greyi.*

As an alternative the following table perhaps better expresses the relationships of the four forms :—

a. Ground-colour or interspaces bay or chestnut, stripes black or blackish brown.

b. Stripes on neck and shoulders very short and narrow, not reaching the middle line of the throat, and on the body scarcely passing beyond the withers *Danielli.*

*b*¹. Stripes broad and long, on the neck reaching for the most part the middle line of the throat and on the body extending to the white of the belly, those on its posterior half breaking up into large spots *quagga.*

*a*¹. Ground-colour or interspaces, at least of the neck, creamy yellow; stripes brown.

c. Stripes exceedingly wide, &c. (as above) *Lorenzi.*

*c*¹. Stripes much narrower, &c. (as above) *Greyi.*

It is not easy to point out the exact relationship between these four forms. The two that depart farthest from the typical *Burchelli* are *Danielli* on one side and *Greyi* on the other, *Lorenzi* holding an intermediate position between *Burchelli* and *Greyi*, and *quagga* a similar position between *Burchelli* and *Danielli*. *Quagga* may have been derived from *Burchelli* by an increase in the rufescence of the interspaces all over the body, neck, and head, by the disappearance of the stripes on the hind-quarters, and by the splitting into spots of those on the posterior half of the body. The

wide interval between this form and the typical *Danielli* is to a certain extent bridged by the specimen figured by Hamilton Smith. On the other hand, *Lorenzi* may have been derived from *Burchelli* by the widening and rufescence of the stripes, and *Greyi* from *Lorenzi* by the almost complete obliteration of all lines of demarcation between the stripes on the body behind the shoulder.

Thus the available facts seem to point to the conclusion that the ruddiness of Cape Colony quaggas was acquired by two totally different processes. In the case of *Danielli* by deepening of the red of the ground-colour or interspaces and the reduction in the length and width of the black stripes on the neck and shoulder concomitantly with their suppression on the body, the result being a chestnut- or bay-coloured animal with narrow black stripes on its fore parts. In the case of *Greyi* by an increase in the width and brownness of the stripes, followed by their fusion and loss of definition on the body, the result being a ruddy-brown animal marked with narrow pale bands (the interspaces) upon the head, neck, and shoulder. Finally, I do not see how to bridge the difference between *Lorenzi* and *quagga* without reference to an intermediate form which must have very closely resembled a typical *Burchelli*. In that case the Cape Colony quaggas have had a dual origin from a Burchelline quagga or quaggas; and if this be so, how are we to regard them as a single species distinct from *Burchelli*?

The objection may perhaps be raised that this classification of the Cape Colony quaggas does not include all the forms represented by figures scattered through the literature, and that a large number of the latter cannot be referred to any of the types here named. For instance, the examples figured from life in the 'Knowsley Menagerie,' though standing in some particulars midway between the typical Quagga and Grey's Quagga, are certainly distinct from both. It is the assumed existence of such intermediate types as these that justifies the subspecific rank assigned to the quaggas discussed in this paper.

EXPLANATION OF THE PLATES.

Plate IX.

Edwards's Quagga (*Equus quagga*, typical form). Reduced uncoloured copy of the coloured plate, taken from life, of the typical Quagga in Edwards's 'Gleanings.'

Plate X.

Daniell's Quagga (*Equus quagga Danielli*, subsp. n.). Reduced uncoloured copy of the coloured plate, taken from life, of the "Quahkah" in Daniell's 'African Scenery.'

XLVI.—*Rhynchotal Notes.*—XXVII. By W. L. Distant.

HOMOPTERA.

Fam. Cicadidæ.

Subfam. *Cicadinæ* (continued from p. 303).

Division Cicadaria.

In this division the lateral margins of the pronotum are more or less convex, but not toothed; the tegmina and wings are quite clear, as in many species of the genus *Cicada*, or semiopaque, as represented in the genus *Cryptotympana*; the head is broad and (including eyes) always a little, and generally considerably, wider than base of mesonotum.

Synopsis of Genera.

A. Metasternum not or very slightly elevated, and not provided with a posterior process.
 a. Lateral margins of the pronotum with a distinct anterior lobe *Macrotristria*.
 b. Lateral margins of pronotum without anterior lobe *Cicada*.
B. Metasternum elevated at middle and furnished with a posterior process directed backward *Cryptotympana*.

Genus Macrotristria.

Macrotristria, Stål, Œfv. Vet.-Akad. Förh. 1870, p. 714.

Type, *M. angularis*, Germ. (*Cicada*).

Macrotristria nigronervosa, sp. n.

♀. Head, pronotum, and mesonotum ochraceous; head with the face castaneous, ornamented with a piceous central fascia and an oblique ochraceous spot on each side of base, the area of the ocelli, inner margins of eyes, and narrow basal margin black; pronotum with two very small subbasal, central, black spots; mesonotum with two central obconical spots on anterior margin black, each with a small ochraceous spot, the anterior margin on each side of these spots also narrowly black; abdomen above black, posterior segmental margins narrowly ochraceous, the margin of the sixth and base and apex of anal segment broadly ochraceous; body beneath and legs ochraceous, anterior and intermediate tibiæ and tarsi castaneous, body more or less

greyishly pilose; tegmina semihyaline, venation fuscous, basal cell, costal membrane, and costal area ochraceous, transverse veins at apices of first, second, fourth, and fifth ulnar areas more or less piceously infuscated and with a small fuscous spot on each longitudinal vein (excluding uppermost) to apical areas; wings semihyaline, venation ochraceous, apically fuscous, base narrowly ochraceous.

Face very globular and prominent; head (including eyes) wider than anterior margin of pronotum; rostrum reaching posterior coxæ.

Long., excl. tegm., ♀ 32 mm.; exp. tegm. 95 mm.

Hab. North Queensland.

Allied to *M. intersecta*, Walk., from which it differs by the more prominent face, spotted tegmina, different colour-markings, &c. I have not seen the male.

Genus Cicada.

Cicada, Linn. Syst. Nat. i. p. 704 (1766).
Subgen. *Chremistica*, Stål, Œfv. Vet.-Akad. Förh. 1870, p. 714.
Subgen. *Diceroprocta*, Stål, *loc. cit.*

Type genus *Cicada*—*C. plebeja*, Scop.
„ subgen. *Chremistica*—*C. viridis*, Fabr. (*Tettigonia*).
„ „ *Diceroprocta*—*D. transversa*, Walk. (*Cicada*).

Cicada Andrewsi, sp. n.

♀. Body and legs pale ochraceous; eyes piceous; ocelli shining testaceous; pronotum with the lateral areas from inner incisure to edges of margins pale brownish castaneous; tegmina and wings pale hyaline, unspotted, and without any suffusions, the venation ochraceous.

Head with the vertex longitudinally incised, face moderately globose, with an obscure central longitudinal sulcation, its lateral areas transversely striate; pronotum with its disk posteriorly, centrally, transversely incised before the posterior margin, which is strongly transversely striate; rostrum reaching the posterior coxæ.

Long., excl. tegm., ♀ 30 mm.; exp. tegm. 92 mm.

Hab. Japan: Yesso (*Walter Andrews*, Brit. Mus.).

Cicada umbrosa, sp. n.

♂. Body umber-brown; the two central oblique incisures to pronotum black; mesonotum with two central obconical spots extending about halfway between anterior margin and the basal cruciform elevation, obscurely piceous, and on each

side of these an elongate and angulate spot which reaches the area of the cruciform elevation, black; body beneath and legs dark ochraceous, a little paler than above. Tegmina and wings talc-like, with a greyish-brown tint, the venation and costal membrane of tegmina ochraceous, tegmina unspotted.

Head (including eyes) wider than anterior margin of mesonotum; head with the front moderately prominent; face broad and tumid, the transverse ridges very prominent; rostrum just passing the intermediate coxæ; opercula longer than broad, concolorous, not extending beyond the base of abdomen, centrally obliquely divergent, their apices broadly subacutely rounded.

Long., excl. tegm., ♂ 33 mm.; exp. tegm. 97 mm.

Hab. Borneo (*Doherty*).

Cicada boliviana, sp. n.

♂. Head, pronotum, and mesonotum chocolate-brown; lateral areas of front, a transverse fascia between eyes, anterior margin, and two linear obconical spots to mesonotum black; abdomen above castaneous; tympanal coverings and anterior abdominal segmental margins black; a large cretaceous spot occupying the marginal areas of each segment; body beneath dull ochraceous, more or less cretaceously tomentose; tegmina and wings pale hyaline, the venation brownish or fuscous, bases of both pale greenish; costal membrane of tegmina pale brownish to a little beyond apex of radial area.

Head (including eyes) considerably wider than base of mesonotum, eyes very prominent; rostrum passing the intermediate coxæ; opercula just reaching the base of second abdominal segment, their inner margins at base contiguous but not meeting, their posterior margins sinuately oblique, their outer margins a little convex.

Long., excl. tegm., ♂ 35 mm.; exp. tegm. 102 mm.

Hab. Bolivia: Chimali.

Genus Cryptotympana.

Cryptotympana, Stål, Ann. Soc. Ent. Fr. (4) i. p. 613 (1861).

Type, *C. pustulata*, Fabr.

Cryptotympana Holsti, sp. n.

♂. Body black; a small spot on each lateral area of the posterior pronotal margin, lateral abdominal segmental

marginal spots above and beneath, lateral margins of face, a central spot to femora beneath, and lateral margins of opercula reddish testaceous. Tegmina and wings pale smoky hyaline; less than basal half of tegmina and more than basal half of wings black, these black areas with some obscure longitudinal reddish-testaceous streaks, and the costal areas beyond them more or less piceous. Head broad, including eyes wider than base of mesonotum; face broad and subglobose; rostrum just passing the intermediate coxæ; opercula reaching the third abdominal segment, their basal inner margins moderately straight and contiguous, and then obliquely divergent to apex, which is situate near lateral abdominal margin.

Long., excl. tegm., ♂ 48 mm.; exp. tegm. 128 mm.

Hab. Central Formosa (*Holst,* Brit. Mus.).

Allied to *C. aquila*, Walk., but differing widely (apart from colour) by the shape of the opercula.

Division Polyneuraria (*ante*, p. 293).

By the kindly help of Mons. Joanny Martin, of the Paris Museum, Dr. Handlirsch, of the Hofmuseum, Vienna, and Dr. Gestro, of the Genoa Museum, I have examined the types belonging to this division, representing species which I had not hitherto seen. I can now with greater certitude describe the following species.

Platypleura longula, sp. n.

♂. Head, pro- and mesonotum, tympanal coverings, sternum, opercula, rostrum, and legs brownish ochraceous; abdomen piceous, the posterior margins of the segments and the anal segment brownish ochraceous; head with base of face and a somewhat broken transverse fascia between eyes piceous; pronotum with the lateral and posterior margins paler, sometimes greenish ochraceous, the disk with a central longitudinal piceous fascia, which is sometimes subobsolete; mesonotum with four central spots on anterior margin, a long fasciate oblique spot on each lateral area, and a small spot in front of each anterior angle of the cruciform elevation piceous or black; tegmina talc-like, semihyaline, the costal membrane and costal area, basal cell, and claval area dull pale ochraceous, venation ochraceous on about basal half, fuscous on remaining area, the transverse veins at the apices of the upper three ulnar areas a little piceously infuscated, and a

small fuscous spot on each longitudinal vein (excluding uppermost) to the apical areas; wings semihyaline, the basal area with some pale fuliginous streaks.

Head (including eyes) about equal in width to base of mesonotum; lateral margins of pronotum angularly dilated; abdomen moderately long and posteriorly attenuated, about as long as from apex of face to base of cruciform elevation; rostrum reaching the posterior coxæ; opercula small, their posterior margins subtruncate, a little oblique, lateral margins oblique, not meeting inwardly; costal membrane of tegmina rather broad.

♂. Long., excl. tegm., 19–20 mm.; exp. tegm. 58–62 mm.

Hab. Delagoa Bay.

This species, described from two male specimens, belongs to the subgenus *Oxypleura*, A. & S., and, apart from colour-markings, may be easily separated from allied species such as *P. brevis*, Walk., by the elongated abdomen and the considerably broader costal membrane to the tegmina.

Platypleura mira, sp. n.

Head, pronotum, and mesonotum castaneous; upper margins of face continued on each side to eyes, a fascia between eyes (centrally obsolete), and broken basal margin to head black; basal and lateral margins to pronotum ochraceous, the incisures piceous; mesonotum with two short, central, contiguous, obconical spots, on each side of which is a much longer spot, a spot at each anterior angle of basal cruciform elevation, a small central spot to same, and a transverse spot on each side of it, black; abdomen above black, the tympanal coverings and posterior margins of the segments brownish ochraceous; body beneath piceous, transverse striations to face, undersides of trochanters and femora, and apical abdominal segment more or less castaneous; opercula testaceous, with base and apex piceous; tegmina brownish ochraceous, crossed by an irregular piceous fascia passing through radial area and base of third ulnar area and terminating on claval margin, another broader and browner fascia commencing at end of radial area and terminating near anterior angle of lower apical area; this fascia is outwardly fused with other mottlings of the same colour which almost occupy the apical tegminal area; wings ochraceous, a subcentral spot extending from costa to near middle of wing, and the outer margin widened towards abdominal area, piceous.

Head (including eyes) as wide as base of mesonotum; rostrum reaching the posterior coxæ; opercula broad, not

meeting inwardly, extending to second abdominal segment, the lateral and posterior margins moderately convex.

Long., excl. tegm., 23 mm.; exp. tegm. 75 mm.

Hab. Laos (*Dr. Neis*, Paris Mus.).

This species belongs to the subgenus *Pœcilopsaltria*.

Platypleura melania, sp. n.

Head and pronotum dull dark ochraceous; head with subbasal margin of face and a broad transverse fascia between eyes (including area of ocelli) black; pronotum with the lateral and posterior margins pale ochraceous, a central longitudinal fascia much widened anteriorly and at inner edge of basal margin, the incisures, and outer lateral margins black; mesonotum black, with two discal obconically looped fasciæ (representing the margins of four obconical spots), a broken lateral fascia, and the disk of cruciform elevation, pale ochraceous; abdomen black, in two female specimens the posterior segmental margins obscurely ochraceous; rostrum fuscous, its basal joint pale ochraceous; anterior and intermediate legs fuscous, inner streaks and apices of femora, and bases of tibiæ, ochraceous, posterior legs ochraceous; tegmina piceous, with pale grey markings, of which the principal are two or three in radial area, an excavated spot beneath it at base of third ulnar area, three spots beneath apex of radial area, the uppermost on anterior margin of fourth ulnar area, some broad spots near apices of upper three ulnar areas, and some more obscure outer marginal spots; wings ochraceous, outer marginal area piceous, inwardly lanceolate.

Head (including eyes) as broad as base of mesonotum; rostrum passing the posterior coxæ; opercula in male well separated internally, their lateral margins distinctly sinuate, their posterior margins obliquely subconvex.

Long., excl. tegm., ♂ 19, ♀ 20 mm.; exp. tegm., ♂ ♀, 60–61 mm.

Hab. S. Nigeria (*Dr. S. A. Jones*, ♀, Brit. Mus.); Congo (♂, Coll. Dist.).

Belonging to the subgenus *Pœcilopsaltria*, Stål.

Platypleura Bettoni, sp. n.

Head and pronotum ochraceous; head with two transverse waved black lines, one crossing base of face, the other passing through the area of the ocelli, a small black spot a little before each eye; pronotum with the central lateral margins, a central broken longitudinal line, which is widened

anteriorly and posteriorly, and the incisures black; mesonotum and abdomen darker ochraceous, the first with two anterior, central, obconical spots, on each side of which is a transverse basal patch, a sublateral oblique line on each side, and a small rounded spot in front of each anterior angle of the basal cruciform elevation; abdomen above with the segments (excluding basal and apical) broadly piceous on each side; body beneath and legs ochraceous; tegmina with about basal half greyishly ochraceous and opaque, crossed by an oblique brown fascia passing through radial area and outwardly broadly of the same hue, a small round brown spot at base and apex of radial area, the last preceded by a transparent talc-like spot; apical half transparent, talc-like, the apices of the three upper ulnar areas crossed by an oblique fuscous and greyish fascia, and a series of spots of the same colour at the apices of the longitudinal veins to apical areas; wings with nearly basal two thirds ochraceous, remaining area pale hyaline.

Head (including eyes) as broad as base of mesonotum; tympanal coverings and opercula pale fulvous, the last overlapping internally, a little sinuate laterally, slightly convex posteriorly; rostrum just passing the posterior coxæ.

Long., excl. tegm., ♂ 17 mm.; exp. tegm. 53 mm.

Hab. Brit. E. Africa: Changamwe (*C. S. Betton*, Brit. Mus.).

Belonging to the subgenus *Pœcilopsaltria*, Stål.

Pycna cœlestia, sp. n.

Head and pronotum olivaceous green; head with anterior margin of face and its basal angles, a marginal spot on each side of vertex, area of the ocelli, and two spots on each side of same, black; pronotum with a central lanceolate spot before posterior margin and the incisures black; mesonotum pale castaneous, with two short, central, obconical spots at anterior margin, a much longer spot on each side of them, and a central lanceolate spot, the base of which occupies the area of the cruciform elevation, on each side of which is a transverse spot, black; tympanal coverings olivaceous; abdomen black, the posterior segmental margins olivaceous; sternum, rostrum, and legs brownish; opercula and apex of abdomen olivaceous; tegmina with about basal half brownish opaque, remaining area pale hyaline; in the opaque area there are two spots on costal membrane, a transverse fascia crossing radial area to upper margin of lower ulnar area, a spot on each side of basal cell, a claval streak, and a large

spot beyond radial area, piceous or black; the brown coloration also contains some paler spots; on the outer hyaline area there is a waved spot commencing at costa and crossing bases of first to fourth apical areas, some submarginal spots, a small spot on each side of the apices of longitudinal veins to apical areas, followed by a larger spot on extreme outer margin, piceous or black; wings black, their outer fourth pale hyaline.

Head (including eyes) about two thirds the width of base of mesonotum; rostrum reaching base of abdomen, its apex black; opercula broadly transverse, their inner angles overlapping, their outer and lateral margins moderately convex.

Long., excl. tegm., ♂ 20–22 mm.; exp. tegm. 72–76 mm.

Hab. N.W. China (*Dr. W. M. Crowfoot,* Brit. Mus.); W. China (*Pratt,* Coll. Dist.).

This species has a strong superficial resemblance to a very large example of *Platypleura nobilis*, Fabr., but belongs to the genus *Pycna* by the relative breadths of the head (including eyes) and the base of mesonotum.

Ugada Nutti, sp. n.

Allied in general coloration to *U. Stålina*, Butl., less so to *U. grandicollis*, Germ., from both of which it differs by the much longer and more acute lateral pronotal angles, the broader central sulcation to face, the opercula in male only nearly meeting, and not overlapping internally as in *U. Stålina*; rostrum reaching but not passing the posterior coxæ. By the shape of the pronotum it is more allied to *U. limbata*, Fabr., from which it differs by the pale castaneous wings, more sharply angulated lateral angles of pronotum, broader longitudinal sulcation to face.

Long., excl. tegm., ♂ ♀ 33 mm.; exp. pronot. angl., ♂ 21, ♀ 23½ mm.; exp. tegm., ♂ 102, ♀ 112 mm.

Hab. Nyasa plateau, near Tanganyika (*W. H. Nutt,* Brit. Mus.).

The British Museum possesses one male and one female specimen.

XLVII.—*On a Pneumatic Type of Vertebra from the Lower Karroo Rocks of Cape Colony* (Tamboeria Maraisi). By H. G. Seeley, F.R.S.

In August 1889 I found at Tamboer Fontein, between Fraserburg Road Station and Fraserburg, an isolated vertebra, loose upon the surface, which differs in type from all reptiles

known from the Karroo rocks of South Africa. It is in a poor state of preservation, having travelled from higher ground, and by rolling has lost the neural spine, zygapophyses, facets for the ribs, and is otherwise worn. But exposure has removed much of the intractable matrix, and I have cleared enough of what remained to show the more important characters of the vertebra. It is an inch and a half long, with the centrum laterally compressed, showing intercentral facets, with a central notochordal pit impressing the centre of each articular face. The neural arch is not conspicuously elevated, is somewhat widened in front, and is deeply excavated on the under surface for pneumatic foramina, in the manner seen in the cervical vertebræ of birds and vertebræ of Saurischian Dinosaurs. The external surface-layer of bone is dense and smooth.

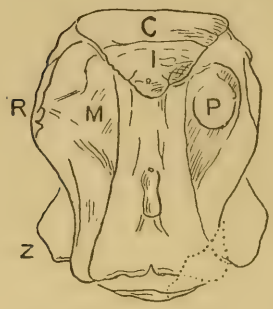
The anterior articular face of the centrum (fig. 1, C, p. 338) is wider transversely than deep, measuring fully six tenths of an inch from the neural canal to the notched-out articular facet for the intercentrum, and is eight tenths of an inch wide. This surface of the centrum is convex from the central pit outward, resembling the faces of the vertebræ preceding the caudal fin of an Ichthyosaur, suggesting free movement; but it is slightly rubbed and weathered.

The facet for the intercentral ossification (I) is triangular, wider than deep, placed below and behind the vertical articular face, and in lateral view looks obliquely forward and downward, is rounded from side to side, and has the aspect of excavating the base of the articular face (fig. 2, A.I).

The posterior articular face of the centrum (fig. 1) has a much smaller intercentral facet, chiefly resulting from its less depth and more lunate form. The total depth of the posterior surface of the vertebra a little exceeds the anterior depth (fig. 2, P.C), so that the articular face of the centrum was more nearly circular; it is inclined a little forward, making the measurement along the neural canal about one tenth of an inch shorter than along the ventral margin. A series of such vertebræ would be concave on the dorsal aspect, like the vertebræ of the neck, elevated in the usual way.

The body of the centrum measures about one inch and one tenth from front to back, along the narrow concave ventral surface, between the anterior and posterior margins of the intercentral facets. This inferior part of the body of the vertebra is somewhat flattened from side to side, with a deep median longitudinal groove in its middle length (fig. 1). It is compressed from side to side, with the transverse width reduced to little more than a quarter of an inch, at a quarter of an

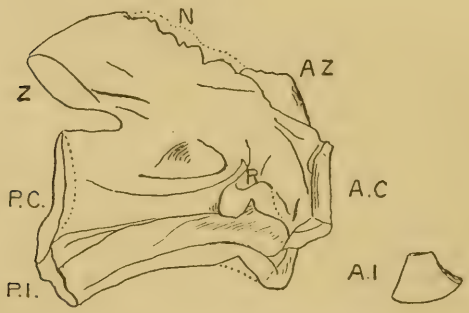
Fig. 1.



Cervical vertebra of *Tamboeria Maraisi*. Inferior aspect.

C. Anterior articular face.
I. Facet for intercentrum.
P. Pneumatic foramen under the neural arch.
M. Matrix.
R. Broken process for the cervical rib.
Z. Posterior zygapophysis.

Fig. 2.



Lateral aspect of the same.

A.C. Anterior face of centrum.
P.C. Posterior face of centrum.
A.I. Anterior intercentral facet, with restored section of intercentrum.
P.I. Posterior intercentral facet.
R. Articular surface for rib (broken) above the ridge which covers the pneumatic foramen.
Z. Zygapophysis.
N. Indication of base of the neural spine.
A.Z. Broken base of left anterior zygapophysis.

inch behind the anterior intercentral facet. Hence the sides of the centrum are concave in length, so that the lateral compression is greatest immediately under the attachment of the rib (fig. 2, R), where the pneumatic excavation seen from below occupies the anterior half of the length of the centrum.

The pneumatic impression or excavation is apparently situate between the centrum and the neural arch, though the neuro-central suture is obliterated. Seen from beneath (fig. 1) it is a pear-shaped or triangular cavity, wide in front and narrow behind, situate between the flattened compressed side of the centrum and the overhanging neural arch. On the underside of this anterior part of the arch, beneath the small broken process for the rib, is an oval hole (P), not unlike the pneumatic foramen seen in the wide cervical vertebræ of Cretaceous Ornithosaurs. In Ornithosaurs the foramen is below the ridge which extends between the anterior and posterior zygapophyses, but the ridge which forms the upper boundary of this foramen extends forward on the side of the centrum from the middle of its posterior articular face, with a concave lateral contour, which widens transversely to the position above the foramen, and then narrows towards the anterior articular face (fig. 2). The ridge is compressed and rounded from above downward. Above it in the middle of the side is a pit or depression, which separates this ridge on the centrum from the less conspicuous zygapophysial ridge above it, upon the neural arch, which is badly preserved. In morphological position this foramen makes an approximation to that seen laterally on the anterior part of cervical vertebræ of Saurischian reptiles, and especially to some of the Cetiosauria. But it differs from American types in the excavation being undivided vertically and in the foramen itself looking downward (fig. 1, P), so as to be invisible from the side (fig. 2).

The small transverse process above the foramen arches, somewhat in a penthouse form. Its fractured base is less than half an inch long. It was probably very short and may have been co-ossified with the cervical rib as in Saurischian types like *Cœlurus*, and in Ornithosaurs. There is necessarily no evidence as to its articulation with the intercentrum; but such a relation is found in the early vertebræ of *Cynognathus*, in which the intercentral ossifications are of larger size. The imperfect evidence suggests a condition for the cervical ribs intermediate between the Theriodontia and the pneumatic Megalosauria.

The neural canal is of moderate size and appears to be

wider than deep, though the depth posteriorly is reduced by crush, which depresses the neural arch.

The neural arch is rather small, with strong, thick, large posterior zygapophysial processes, which diverge backward and outward, and are angulated superiorly. The facets, which are imperfectly preserved, look downward and outward. The anterior processes, which were small, are lost. The neural spine is lost. Its base was six tenths of an inch long; it appears to have been widest behind, and may have been channelled at the back, in harmony with the notch between the posterior zygapophyses. As preserved, the neural arch has the aspect of being inclined backward.

Taken as a whole, the characters of this vertebra shown on the facets for the intercentra and the articular faces of the centrum appear to me to indicate that the animal from which it was derived was an Anomodont, and not a Saurischian Dinosaur; and it differs from all known members of that group in possessing pneumatic vertebræ. It may therefore indicate a group of Pneumatospondylia, showing some affinity between the Anomodontia and Saurischian Dinosaurs, in which a similar pneumatic condition of the vertebral column is found. In the forms of the pelvic bones, especially the ilium and ischium, there are interesting resemblances between these groups, which extend also to various bones of the limbs, in some genera.

The locality which yielded this bone is chiefly remarkable for the remains of large animals, such as *Pareiasaurus* and *Tapinocephalus*; but at Cypher I found, in association with limb-bones and skull-fragments of those types, the figured fragment of a skull of the Lycosaurian genus *Pristerognathus*. I have seen no vertebrate remains, except those of Lycosauria from the Lower Karroo rocks of that part of Africa, which approximately correspond in size with the animal indicated by this vertebra. Lycosaurian vertebræ are unknown from African specimens.

There is a general resemblance in type to the vertebra named *Arctosaurus*, though that genus shows no indication of a pneumatic excavation or of intercentra. I followed the trail of travelled and broken bone-fragments up the slope down which they had been swept by the rains for a considerable distance without finding any further evidence of the animal, unless it is a much smaller crushed dorsal vertebra too distorted for description, which has some resemblance to *Arctosaurus*.

The name suggested for the species commemorates the

locality, Tamboer Fontein, where it was found, and the friendly help of the gentleman, Mr. J. S. Marais, who aided me in collecting larger fossils upon his farm.

Doubt has of late been current concerning the significance of pneumatic foramina in fossil bones, and is put forward verbally and in print by Professor H. F. Osborn. In an article in the 'Century Magazine' for September 1904, similar in scope to the lecture given at Cambridge in August to the British Association, he enunciates the same views. Writing of *Ornitholestes*, Professor Osborn remarks:—"Externally its bones are simple and solid-looking, but, as a matter of fact, they are mere shells, the walls being hardly thicker than paper, the entire interior of the bone having been removed by the action of the same marvellous law of adaptation which sculptured the vertebræ of its huge contemporaries. There is no evidence, however, that these hollow bones were filled with air from the lungs, as is the case of the bones of birds."

Ornitholestes is compared with *Cœlurus*, *Hallopus*, *Ornithomimus*, and *Aristosuchus*. It is known from the skull, forty-five vertebræ, pelvis, and representative parts of both fore and hind limbs of one individual (Bull. Am. Mus. Nat. Hist. vol. xix. p. 459). But from the context quoted I gather that the author's conclusions should be applied not only to *Ornitholestes*, but to the pneumatic vertebræ of the largest Dinosaurs, possibly to all fossil pneumatic bones which are not referable to birds.

The current belief that a pneumatic vertebral column is evidence of the prolongation into the bones of air-cells from the lungs is an inductive conclusion, based upon the evidence from the parallel condition in the bones of birds. This evidence is affirmed by Prof. Osborn, in the passage quoted, not to exist, and in place of it he offers what is termed the "Law of Adaptation" as having sculptured these huge vertebræ. I have met with no enunciation of this law; and until it is explained how it differs in physiological action from the processes which sculpture or excavate the bones of birds, it will be difficult to judge whether we are offered a law, a suggestion, or only words, for no law will produce anatomical effects without corresponding physiological circumstances to sculpture the bones.

If the influence of pneumatic pressure produces a well-

known osteological result in excavation of a bone in a bird, what is there in the vertebra of a Dinosaur to suggest that similar effects have been produced by dissimilar causes? And it would be interesting to find in an extinct order of animals evidence that an agency unconnected with the lungs produced results which differ from those in birds only in being the effect of larger areas of pressure acting laterally upon the sides of the vertebræ. But the evidence that there was any essential difference in the origin of these structures in Dinosaurs and birds is not forthcoming; and if it ever existed is lost with the soft parts of the animal.

Nevertheless cavities are formed in certain bones in animals of varied organization, which are not connected with the lungs in the manner of air-cells of birds, but they are chiefly in the skull. They are slightly developed in existing reptiles, but are most conspicuous in warm-blooded animals. The skulls of elephants exhibit a maximum development of pneumatic cavities which have no connexion with the lungs, and the texture of these bones closely approximates to that of cellular vertebræ in some Cetiosaurian Dinosaurs, such as *Ornithopsis* and its American representatives. The resemblance between the mammal skull and the reptile vertebra is one of analogy. There are no facts to support the inference that the cause which *expanded* the cranial bones of the elephant and other mammals is identical with that which absorbed and excavated the bony tissue, but did not augment the size of the cervical and dorsal vertebræ of Dinosaurs. There is no basis for comparison between the conditions in mammals and these extinct reptiles, for no mammal shows a pneumatic vertebral column which can be compared with these Dinosaurs; and when a mammalian vertebra is hollow it is not comparable, since there is no pneumatic foramen.

On the other hand, Dinosaurs are not conspicuous for pneumatic cavities in bones of the skull, and there are therefore no facts to suggest the idea that they might by analogy develop a pneumatic vertebral column which was not connected with the lungs, even if the cranial and vertebral pneumatic structures had been comparable.

The influence of the lungs as a whole in modifying the vertebral column of a reptile is manifest in the dorsal vertebræ of Testudinata. In tortoises, under conditions of terrestrial life, the lungs have expanded and given the carapace a remarkable elevation. At the same time the neural arches have become raised, and the lungs have pressed evenly against the sides of the centra of the vertebræ till they have become narrowed into thin plates by the tissue

being absorbed laterally. But the lung never penetrates into the substance of the vertebra or excavates holes in the bones in existing reptiles comparable to those seen in skeletons of Dinosaurs, Ornithosaurs, and birds.

The influence of the lungs on the vertebral column of a Dinosaur as distinct from the air-cells may be, perhaps, inferred from the elevated condition of the neural arch and upward direction of transverse processes under which the lungs extended in such a type as *Diplodocus*, described by Prof. Osborn and the late Dr. J. B. Hatcher. It is reasonable to infer that the lungs were so large that their intermittent upward pressure stimulated the growth of the neuro-central suture to form the high neural arch; but as they were not confined by an unyielding envelope in the same way that the carapace confines the lungs of tortoises, there is but little lateral compression of the body of a vertebra as a consequence of absorption, which was localized laterally about the pneumatic foramen.

All down the vertebral column in *Diplodocus* the vertebræ are excavated, and the lateral holes were termed by Dr. Hatcher pleuro-central cavities. They have been well described in *Ornithopsis*. Their distinctive feature is that in the dorsal region the lateral foramina expand within the centrum into large chambers separated by a median vertical longitudinal partition, and each is commonly divided into unequal anterior and posterior parts by an imperfect vertical transverse lamina of bone. From this primary lateral cavity bone-cells commonly extend to the articular faces of the centrum and other parts of the vertebra. This condition of the pneumatic vertebræ is only dissimilar to that of birds in its details. In no existing animals except birds is a similar pneumatic structure found in the vertebral column, and it is only known in connexion with air-cells prolonged from the lungs. There is no fact to suggest that the lungs themselves were extended into the pleuro-central cavities of Dinosaurs: such an idea is not consistent with the pneumatic condition of the vertebræ in the elongated neck and tail. But with the general resemblance to the condition in the bones of birds it has been inferred that the pneumatic pressure, which was persistent enough to absorb the bone locally and laterally, was greater in Dinosaurs than in birds, because the cavities excavated are larger. Although this pressure, judged by its effects, was most potent in the dorsal region of the lungs, it also extended to the neck and tail, as in certain birds. It is therefore inferred that no cause is known except prolongation of air-cells from the lungs into the bones which is capable of

producing these results, for from no other source in nature is the pressure derived which penetrates in this way into the skeleton.

This is inductive evidence from physiology and comparative anatomy. In place of it Professor Osborn has offered nothing except the following passage:—"The dominating principle in construction of the backbone is maximum strength with minimum weight. The ingenuity of sculpture by which this is brought about, every single vertebra differing from its fellow, baffles the Lamarckian as well as the Darwinian, and tempts us to revive the old teleological explanation" *. Teleology is not known as an element in science, and explains nothing.

XLVIII.—*Observations on Coleoptera of the Family* Buprestidæ, *with Descriptions of new Species.* By Chas. O. Waterhouse, F.E.S.

[Continued from p. 267.]

Chrysaspis glabra, sp. n.

Elongate, narrow, shining. Thorax blackish cyaneous, the sides tinted with green. Elytra golden green, very delicately punctured, suffused with coppery posteriorly.

Long. 29–31 mm.

Hab. "Dahr el Ghazal (*Colmant*)," "Arrouimi (*Duvivier*)" (*coll. Kerremans*).

This is an elongate narrow insect like *C. elongata*, Ol., but it is less parallel-sided (with a slight tendency to be elliptical) and more convex on the suture of the elytra. The disk of the thorax is nearly black, marked with fine punctures, which are not very close together; the sides are strongly and rather closely punctured. The elytra are bright golden green; the surface is extremely finely punctured and there are numerous slightly larger (but still fine) punctures, forming three double lines, representing the usual costæ, a few being also on the interstices. Prosternum blue. Abdomen greenish golden.

One specimen (♂) has only a trace of coppery colour near the apex of the elytra. In the second specimen (♀) the

* 'Memoirs American Museum of Natural History,' vol. i. part 5, p. 193, "A Skeleton of *Diplodocus*."

deeper reddish copper occupies the greater part of the elytra when viewed in certain lights.

Capt. Kerremans considered these examples to be *C. propinqua*, Saund., but that is a flatter insect, with coarsely punctured elytra and with a coppery-red abdomen.

Chrysaspis aurata, Fabr.

Buprestis aurata, Fabr., Mant. Ins. i. p. 178.

The type of this species is in Hunter's collection in the University of Glasgow, and Prof. J. Graham Kerr has kindly allowed me to examine it.

It is closely allied to the species known in collections as *C. elongata*, Ol. The general form and sculpture are very similar, but it is a slightly broader insect and is quite differently coloured. It is 33 mm. long and 11 mm. broad just below the shoulders. The thorax is obscure golden green, with scarcely a trace of the coppery colour which is present in *elongata*. The punctuation is the same. The elytra are golden green, the yellow tint prevailing; the outer portion of the *apex* is tinted with light coppery. In *elongata* the copper colour does not extend to the margin. The punctuation is throughout distinctly stronger than in *elongata*, the double lines of punctures are consequently more distinct. In some lights a faint coppery tint is seen between these lines. The prosternum and legs are green. The abdomen golden, with light coppery shade as in *elongata*. The type is a male and has the fifth abdominal segment widely and not deeply emarginate. I notice some of the specimens of *elongata* are similar in this respect, others have the emargination deeper and more triangular.

The only specimens of this species I have ever seen are the type and two examples from Sierra Leone in Dr. Heath's collection.

In the Buprestidæ of Wytsman's 'Genera' Capt. Kerremans gives *Chrysodema splendens*, Nonfried, as a synonym of "*Chrysaspis aurata*, Fab." I do not know on what authority he places *splendens* in the genus *Chrysaspis*. From description I should not have taken it to belong to that genus; but anyhow it is certainly not *aurata*. The insect labelled "*aurata*?" in his collection is *auricauda*, Saund.

C. glabra, above described, has the colour of the elytra distributed in the same manner as in *aurata*; but *glabra* is a more convex, less parallel species, it is more brilliant, and, although of a golden green, it is nevertheless of a deeper colour than *aurata*, in which the yellow prevails.

Chrysaspis tincta, sp. n.

Broad, brilliant. Head and thorax dark cyaneous, the sides with a slight tint of green. Elytra bright golden green, with a deeper reddish-golden tint in some lights. Body beneath brilliant coppery red.

Long. 45 mm.

Hab. Gaboon, Senegal, Ogowé (*coll. Kerremans*).

This and *C. armata*, Kerr., are the two most brilliant of the broad species of this genus. [*C. armata* is at once known by the remarkable strong angular projection at the sides of the elytra.] The thorax is finely punctured on the disk, strongly or closely punctured at the sides, with a smooth spot at the anterior angles. The elytra are of a light golden green; in some lights a golden shade prevails, but more generally there is a fiery-red shade, which spreads over nearly the whole surface.

This insect was labelled "*C. viridipennis*, Saund.," in Capt. Kerremans' collection. It is important to note this, as otherwise his description of *C. kassaiensis*, Kerr., is unintelligible. *C. kassaiensis* is the true *viridipennis*, which has the elytra dark green, much more strongly sculptured and without red shade.

Chrysaspis Welwitschii, Saund.

Capt. Kerremans has redescribed this as *C. marginata*.

Chrysaspis dubia, sp. n.

Very broad, depressed, uniform coppery brown. Elytra with the strong angular projection below the shoulder distinctly visible from above. Abdomen coppery golden.

Long. 46, lat. 18 mm.

Hab. Congo, Kassai (*Tschoffen*) (*coll. Kerremans*).

This specimen was labelled "*C. aurovittata*, Saund.," in Capt. Kerremans' collection. The true *aurovittata* he has described as *vittigera*. I am somewhat in doubt whether *dubia* is really distinct, but the colour is so totally different that for the present I prefer to consider it so. It agrees with *aurovittata* in the basal lateral angulation of the elytra being distinctly visible from above.

Chrysaspis Bennettii, sp. n.

Head and thorax black, the latter slightly tinted with dark green at the margins. Elytra dark bluish green, the disk

shaded with brownish coppery. Prosternum shining bluish green, the abdomen golden coppery. ♂.

Long. 37 mm.

Hab. Congo (*Dr. Bennett*).

This is one of the less brilliant species allied to *aurovittata*, Saund. The thorax is nearly black, with a slight shade of green near the margins. The disk has the punctures very distinct, irregular, but generally separated from each other by one or two diameters of a puncture; a central line almost smooth. The sides more closely and more strongly punctured. Elytra rather dark bluish green, the disks having a slight shade of brownish coppery. The punctuation is rather strong. Dorsally there are five equidistant lines of punctures, *i. e.* there are the usual two pairs of lines with another line between them. Then there is a somewhat broad, closely punctured space, and then the usual lateral pair of lines. Although the punctures are rather close together, there is no transverse rugulosity or confusion. The prosternum is bright bluish green, the central part closely and rather finely punctured. The metasternum is somewhat golden. The abdomen golden coppery, the apical segment very gently emarginate.

Specimens from Capt. Kerremans' collection named *cuneata*, Harold, somewhat resemble this, but the punctuation of the elytra is confused and the prosternum is golden. *C. Bennettii* is, moreover, narrower. The sides of the elytra have the median sinuosity very strong, stronger than in *cuneata*, the margin is greatly thickened, and the angle made just before this sinuosity, although not acute, is much more marked than in *cuneata*.

Chrysaspis Higletti, sp. n.

Thorax obliquely narrowed in front, subparallel posteriorly, dark cyaneous, nearly black, the extreme basal margin coppery, the incrassate smooth margin dark green, and there is a little green at the anterior and posterior angles. The flattened disk is moderately strongly punctured, the punctures generally slightly separate, but sometimes nearly touching each other, the sides closely and rugosely punctured. Elytra rich bluish green, suffused with reddish coppery for two thirds their length, leaving the scutellar region and the suture green. The punctuation is rather strong, forming regular lines, except the usual sublateral irregularly punctured space. The underside of the thorax, the mesosternum, and the legs are bright green. The prosternum plane, rather

closely and finely punctured. The metasternum and abdomen are golden coppery, with green shades. The apical segment of the abdomen is triangularly emarginate.

Long. 41, lat. 15 mm.

Hab. W. Africa, Akropong (*Higlett*).

In its short broad form this most nearly resembles *C. auricauda*, Saund., but it is not quite so short as that is. It differs from that and nearly all the species (except *Bennettii*) in having the punctures on the dorsal region of the elytra arranged in lines. The posterior lateral angulation of the elytra is very strong, almost acute. The space close to the posterior angles of the thorax is finely rugose, but this character may not be constant.

Steraspis arabica, sp. n.

Head black, with green and coppery lines in front. Thorax broad, black, obliquely narrowed in front, almost parallel behind the middle, with a deeply impressed median line, moderately closely and strongly punctured on the disk, rugose at the sides, with a rugose coppery impression extending from the anterior angle to the base, where it is much narrower than in front. The punctures coppery. Elytra more parallel than is usual in this genus, black, with obscure coppery punctuation, which gives them a brown appearance. The punctuation is very fine and irregular. The raised shining black intervals make the surface irregularly rugulose, except that near the scutellum there are some longitudinal lines. Prosternum bisulcate. Abdomen shining steel-blue, each segment with a broad, finely punctured, and pubescent coppery fascia on each side, leaving a narrow median smooth line on the second, third, and fourth segments.

This species is allied to *S. speciosa*, having the abdomen banded in somewhat the same way and the thorax with a median impressed line, but the elytra are finely rugulose, without longitudinal lines except in the scutellar region.

Long. 40, lat. 15 mm.

Hab. Arabia, Muscat (*Dr. Jayakar*).

[To be continued.]

XLIX.—*Notes on the smaller Genera of the* Tabaninæ *of the Family* Tabanidæ *in the British Museum Collection.* By Gertrude Ricardo.

Tabaninæ.

The following table includes the genera comprised in the second division of the Tabanidæ, easily distinguished from those of Pangoninæ, the first division, by the absence of spurs on the hind tibiæ and of ocelli. The genus *Ditylomyia*, formed by Bigot, is not included, as the one species for which he created it belongs to *Gastroxides*, an older genus; Bigot's genus must therefore sink. As regards *Dasybasis*, a genus formed by Macquart for an Australian species, I have no knowledge of it, and its position in the table is only based on his description.

One new genus is included, formed for a species from Ceylon. Remarks on *Hæmatopota* will follow later.

	Hind tibiæ with no spurs. Ocelli absent.	
1.	Third joint of antennæ with four divisions, no tooth or angulation	2.
	Third joint of antennæ with five divisions.	5.
2.	Rings of the third joint of antennæ so distinctly divided that the antennæ appear as six-jointed.....	*Hexatoma*, Meig.
	Rings not so distinctly divided; the antennæ always appear as three-jointed..	3.
3.	Wings marked with rings and circles of darker colouring	*Hæmatopota*, Meig.
	Wings not so marked	4.
4.	First and second joints of antennæ in the male pubescent, the third joint longer than the first. Eyes hairy	*Dasybasis*, Macq.
5.	First joint of antennæ globular, situated on a protuberant projection of the forehead	*Bolbodimyia*, Bigot.
	First joint of antennæ not globular	6.
6.	Third joint of antennæ simple, not furnished with a tooth or distinct angular projection	7.
	Third joint of antennæ furnished with a tooth or a distinct angular projection..	9.
7.	Body covered with metallic scales.....	*Lepidoselaga*, Macq. [*Hadrus*, Perty].
	Body metallic in colouring	*Selasoma*, Macq.
	Body without metallic scales and not metallic in colouring; the first antennal joint longer than is usual in *Tabanus*; wings usually with brown markings ..	8.

8. Antennæ long, the third joint cylindrical, situated on a projecting tubercle.....	*Udenocera*, g. n.
Antennæ not very long, the third joint not cylindrical, not situated on a projecting tubercle	*Diachlorus*, Ost. Sacken [*Diabasis*, Macq.].
9. Abdomen short, stout, very convex	*Stibasoma*, Schiner.
Abdomen not short, stout, or very convex.	10.
10. Antennæ long and slender, the first joint long.....	*Acanthocera*, Macq.
Antennæ not very long and slender, first joint not long.....	11.
11. Species of a slender build, usually with a banded thorax and abdomen, third joint of antennæ slender, mostly with brown markings on the wings.....	*Dichelacera*, Macq.
Species of a stouter build, third joint of antennæ stout	*Tabanus*, L. (in sens. lat.).

Hexatoma, Meig., Syst. Beschr. ii. p. 83 (1820).

Heptatoma, Meig., Illiger's Mag. ii. p. 267 (1803).

Hexatoma pellucens, ♂ ♀, Fabr., Gen. Ins. Mant. ii. p. 308 (1776) (*Tabanus*).

Tabanus albipes, Schrank, Ins. Austr. p. 480 (1781).
Heptatoma bimaculata, Meig., Klass. zweifl. Ins. i. p. 156, pl. ix. figs. 5–10 (1804).

For the full list of references see 'Katalog Paläarktischen Diptera,' Bezzi, vol. ii. p. 54 (Budapest, 1903).

One male and one female from Germany, 58. 80 (*Ruthe*).
One female from Prussia, 4. 6. 92 (*Kirby*).
Two males and one female from unknown locality.

Dasybasis, Macquart.

Dasybasis, Macq., Dipt. Exot. Suppl. 2, p. 25 (1846); Loew, Dipt. Südafrik. p. 31 (1860).

This genus was formed for one species from Australia, and Bigot describes another from Chili. I have no knowledge of either.

The genus is distinguished by its hairy eyes, the hairy first two joints of the antennæ in the male, and by the presence of only four divisions on the third joint, with no tooth or angulation, but slightly swollen in the middle.

D. appendiculata, ♂ ♀, Macq., *l. c.* pl. i. fig. 1; Walker, List Dipt. pt. v. Suppl. 1, p. 267 (1854).—Australia.
D. tristis, ♂, Bigot, Mém. Soc. Zool. Fr. v. p. 621 (1892).—Chili.

Bolbodimyia, Bigot.

Bolbodimyia, Bigot, Wien. ent. Zeit. xi. p. 162 (1892); Röder, *l. c.* p. 237.

This species was formed for one species from Venezuela, viz.:—

Bolbodimyia bicolor, ♀, Bigot.

Bigot describes this striking insect as having 13 or 15 rings on the third joint of the antennæ, but it is more correctly described as having *five* divisions only, of the ordinary size and shape, viz. the large basal division and the four others of about equal size, the last ending in a point. The fly is easily distinguished by the peculiar shape of the first antennal joint and by the protuberant projection on which the antennæ are placed; the front tibiæ are dilated.

Lepidoselaga, Macquart.

Lepidoselaga, Macq., Dipt. Exot. i. (1) p. 153 (1838) (*Lepiselaga*); Loew, Dipt. Südafrik. p. 31 (1860); Schiner, Reise der Novara, p. 96 (1866); Williston, Kans. Univ. Quart. iii. p. 192 (1895); id. Biol. Centr.-Am., Dipt. i. Suppl. p. 262 (1901).
Hadrus, Perty, Del. Anim. Arctic. Brasil. p. 183 (1830).

As pointed out by Williston, *Hadrus* is preoccupied in the order Coleoptera; he agrees with Schiner that the differences between *Hadrus* and *Lepidoselaga* are trivial and that the two should be reunited. They also consider *Lepidoselaga* and *Selasoma* very nearly related, the chief difference between them being in the presence of metallic scales in the one (*Lepidoselaga*) and not in the other. The face in *Selasoma* is more protuberant and the antennæ have the third joint rather broader, with traces of the *Tabanus*-like angulation.

Four species of *Lepidoselaga* have been described, all from South America; but as Williston reunites his *L parva* with *L. albitarsis*, Macq., the number is reduced to three.

L. lepidota, ♀, Wiedem., Auss. zweifl. Ins. i. p. 193 (1828) (*Tabanus*); Macq., Dipt. Exot. i. (1) p. 154, pl. xviii. fig. 3 (1838) (*Lepiselaga*); Perty, Del. Anim. Arctic. Brasil. p. 183, pl. xxxvi. fig. 9 (1830); Walker, List Dipt. i. p. 209 (1848); id. pt. v. Suppl. 1, p. 272 (1854); Schiner, Reise Novara, p. 96 (1866); Loew, Berlin. ent. Zeit. xiii. p. 6 (1869); Townsend, Ann. & Mag. Nat. Hist. (6) xix. p. 19 (1897) (*Hadrus*); Williston, Kans. Univ. Quart. iii. p. 192 (1895); id. Biol. Centr.-Am., Dipt. i. Suppl. p. 262 (1901). [? *Hæmatopota crassipes*, Fabr., Syst. Antl. p. 108 (1805); Wiedem., Dipt. Exot. i. p. 97 (1821); id. Auss. zweifl. Ins. i. p. 220 (1828); Walker, List Dipt. pt. v. Suppl. 1, p. 270 (1854) (*Diabasis*).]—New Granada, Brazil, Guiana.

L. albitarsis, ♀, Macq., Dipt. Exot. Suppl. 4, p. 36 (1850); Wulp, Tijd. Ent. xxiv. p. 161 (1881). [*L. parva*, ♀, Williston, Kans. Univ. Quart. iii. p. 192 (1895); id. Biol. Centr.-Am., Dipt. i. Suppl. p. 262 (1901).]—Buenos Ayres, Paraguay.

L. recta, ♀, Loew, Berlin. ent. Zeit. xiii. p. 6 (1869); Ost. Sack. Cat. Dipt. N. Amer. p. 55 (1878); id. Biol. Centr.-Am., Dipt. i. p. 57 (1886). [*Hadrus lepidotus*, ♂, Bellardi (nec Wiedem.), Ditt. Mess. i. p. 75 (1850); Loew, *l. c.*]—Central America.

1.	Antennæ ferruginous, black at the apex. Forehead wide	*albitarsis*, ♀, Macq.
	Antennæ wholly ferruginous. Forehead not so wide	2.
2.	The space between the antennæ and the frontal callus is brownish	*lepidota*, ♂ ♀, Wiedem.
	The space between the antennæ and the frontal callus is yellowish	*recta*, ♀, Loew.

Williston does not think that the distinction given by Loew for *L. recta*, as above, is valid, and he reunites it to *L. lepidota*.

Lepidoselaga lepidota, ♀, Wiedem.

Two females from Para, 49. 1 (Bates Coll.); one female from Honduras (Miller Coll.), 283; two females, voyage H.M.S. 'Herald,' Panama, 60. 45; one female from Connany, Guiana, Oct. 23, 1895 (*Goeldi*), 96. 238; six females from Montalegre, on S.S. 'Faraday,' 27. 1. 96 (*Austen*); one female from W. end of Parana de Bugassu, 15. 1. 96 (*Austen*); one female from near Breves, S.S. 'Faraday,' 14. 1. 96; one female from Brazil, 99. 195 (*Piffard*); eleven females from Brazil, 24. 4. 1901 (*Durham*), 1901. 232; five females from Tylor-Townsend Coll.; five females from below Itacoatura, R. Amazons, S.S. 'Jerome' (Tylor-Townsend Coll.), purchased from E. Brunetti, 1903. 16.

There is a note attached to one of the specimens by Bates as follows:—"The Motúca of the Indians; it is the scourge of the Upper Amazon. H. Bates, 1859."

This is the insect mentioned by Bates in his 'Naturalist on the River Amazons,' chap. vii. p. 681:—"The mouth of the channel lies about twenty-five miles from Villa Nova; the entrance is only about forty yards broad, but it expands a short distance inland into a large sheet of water. We suffered terribly from insect pests during the twenty-four hours we remained here. In the daytime the Motúca, a much larger and more formidable fly than the mosquito, insisted upon levying his tax of blood. We had been tormented by it for many days past, but this place seemed

to be its metropolis. The species has been described by Perty, the author of the entomological portion of Spix and Martius's travels, under the name of *Hadrus lepidotus*. It is a member of the Tabanidæ family, and, indeed, is closely related to the *Hæmatopota pluvialis*, a brown fly which haunts the borders of woods in summer time in England. The Motúca is of a bronzed black colour; its proboscis is formed of a bundle of horny lancets, which are shorter and broader than is usually the case in the family to which it belongs. Its puncture does not produce much pain, but it makes such a large gash in the flesh that the blood trickles forth in little streams. Many scores of them were flying about the canoe all day, and sometimes eight or ten would settle on one's ankles at the same time. It is sluggish in its motions, and may be easily killed with the fingers when it settles."

In chap. viii. p. 693, he mentions a sand-wasp, *Monedula signata*, which provisions its cells with the Motúca:—

"The *Monedula signata* is a good friend to travellers in those parts of the Amazons which are infested by the blood-thirsty Motúca. I first noticed its habit of preying on this fly one day when we landed to make our fire and dine on the borders of the forest adjoining a sand-bank. The insect is as large as a hornet and has a most waspish appearance. I was rather startled when one out of the flock which was hovering about us flew straight at my face; it had espied a Motúca on my neck, and was thus pouncing upon it. It seizes the fly not with its jaws, but with its fore and middle feet, and carries it off tightly held to its breast. Wherever the traveller lands on the Upper Amazons in the neighbourhood of a sand-bank he is sure to be attended by one or more of these useful vermin-killers."

Lepidoselaga recta, ♀, Loew.

One female (Tylor-Townsend Coll.).

One female from Panzos, Vera Paz (Biol. Centr.-Am. Coll.) (*Champion*).

Selasoma, Macquart.

Selasoma, Macq., Dipt. Exot. i. (2) p. 187 (1838); Loew, Dipt. Südafrik. p. 31 (1860).

This genus was formed by Macquart for one species from S. America, and he suggested *Tabanus cyaneus*, Wiedem., would belong to it, locality unknown.

For remarks on the relationship of this genus to *Lepidoselaga* see under the latter.

It is distinguished by its short, flat, metallic-coloured abdomen, thickened fore tibiæ, and simple third joint of antennæ.

S. tibiale, ♂ ♀, Fabr. Syst. Antl. p. 102 (1805); Wiedem. Dipt. Exot. i. p. 89 (1821); id. Auss. zweifl. Ins i. p. 164 (1828) (*Tabanus*); Macq., Dipt. Exot. i. (2) p. 187 (1838); Walker, List Dipt. pt. v. Suppl. 1, p. 273 (1854); Röder, Wien. ent. Zeit. xi. p. 237 (1892). [*Hadrus chalybeum*, Perty, Del. Anim. Arctic. Brasil. p. 183, pl. xxxvi. fig. 20 (1830). *Hadrus cyaneum*, Walker, List Dipt. i. p. 208 (1848).]—Brazil.

S. cyaneum, ♀, Wiedem., Auss. zweifl. Ins. i. p. 152 (1828) (*Tabanus*); Macq., Dipt. Exot. i. (2) p. 188 (1838); Walker, List Dipt. pt. v. Suppl. 1, p. 273 (1854).—Locality unknown.

The antennæ and legs were both wanting when described by the author; he speaks of it as being a steel-blue insect with hyaline wings.

Selasoma tibiale, ♂ ♀.

One male from Oajaca, Mexico, 58. 135; one female from Mount Roraima, British Guiana, 3500 feet (*Quelch*), 99. 68; one female from Brazil, 45. 56, presented by Mrs. T. P. G. Smith; two females from unknown localities.

Udenocera, gen. nov.

This genus is nearly related to the two South-American genera *Diachlorus*, Ost. Sack., and *Acanthocera*, Macq., and is formed for a species from Ceylon which bears a general resemblance to the latter genus, but is distinguished from it by the absence of a tooth on the third joint of the antennæ, which also divides it from *Dichelacera*, Macq. It is distinguished from *Diachlorus* by the length of the first joint of the antennæ, which is nearly as long as the third joint, and by the altogether longer slender antennæ, the third joint being cylindrical; the fore tibiæ are neither curved nor broader; these differences, together with the presence of a tubercular projection situated more than halfway down the face on which the antennæ are placed, seem to justify the formation of a new genus.

Generic characters.—Antennæ long, cylindrical, with no tooth or projection on the third joint; the first joint is quite two thirds the length of the third joint, the second more than half as long as the first joint, the third joint has the first division as long as the four last divisions together, the

latter being of equal length, with the exception of the last one, which is a little longer, ending in a blunt point; they are situated on the lower edge of a protuberant tubercle which reaches the eyes on each side and is itself placed more than halfway down the face; the forehead is long, gradually narrowing to the vertex. The palpi are *Tabanus*-like in shape, ending in an acute point. The abdomen is long and narrow, the same width throughout. The wings are longer than the body and rather large. The legs are long and slender.

Udenocera brunneus, ♀, sp. n.

Three females from Kandy, Ceylon (*Yerbury*). The type is numbered 31. 5. 92, the others 18. 5. 92 and 30. 5. 92.

Brown. Face shining brown below the antennæ, forming a triangular convex tubercle, with the apex reaching the proboscis, and longer than the cheeks; on each side of the face is a brown shining stripe bordering the eyes for a short distance and then the facial tubercle to its apex; the cheeks are ashy grey, with long white hairs. The proboscis short, the palpi nearly as long; the first joint short, the second stout at its base, curved, ending in a point, yellow, with black pubescence. The first two joints of the antennæ yellow, with black pubescence, the third black; the antennal tubercle brown, shining, grey below; the forehead brown, shining, convex in the middle, with a transverse groove near the tubercle. Eyes bare, the facets of equal size; on the posterior border the eyes project beyond the vertex of the forehead. Thorax brownish, shining, with indistinct linear yellow stripes on each side, yellow at the sides; the breast brown with black hairs, then grey with whitish hairs. Scutellum yellow-brown at extreme base, with yellow pubescence. Abdomen of a uniform brown, somewhat shining, with brown pubescence, the underside yellowish at the base. Legs pale yellow, with the femora, apices of tibiæ, and apices of all the joints of the tarsi except the first one brown; the last joint of the tarsi wholly brown, with pulvilli and claws; the pubescence of the legs is yellow on the yellow parts and black on the brown parts. Wings hyaline, the veins yellowish brown, the fore border and the apex brown; some light spaces are apparent in the brown of the apex; the brown shading extends along the posterior border faintly into the fourth posterior cell; on one wing of the type the apical brown is reduced to a shading of the veins.

Length 11 mm.

There is an imperfect male specimen from Galagedara, Ceylon, June 1897 (*E. E. Green*), 1903. 150, which apparently belongs to this genus, but will form another species, having a yellow abdomen; the antennæ are placed on a similar tubercle and seem of an identical shape, but the third joint is wanting.

The specimen named by Walker *Chrysops parallelus*, and referred by me doubtfully to *Diachlorus* [see Ann. & Mag. Nat. Hist. (7) ix. p. 372 (1902)], from Batjan Island (Batchian) (Wallace Coll.), may possibly belong to this genus; but the antennæ are wanting, the formation of the forehead, of the antennal tubercle and face, besides the shape of the abdomen and legs, agrees with that of the species described above.

Diachlorus, Osten Sacken.

Diachlorus, Osten Sacken, Mem. Boston Soc. ii. p. 475 (1876).
Diabasis, Macq., Hist. Nat. Dipt. i. p. 207 (1834); id. Dipt. Exot. i. p. 150 (1838); Loew, Dipt. Südafrik. p. 31 (1860). ("*Diabasis*" being already occupied in Coleoptera, the name was changed by Osten Sacken.)

This genus was formed by Macquart for the exotic *Tabani, bicinctus, glaber, globicornis*, Wiedem., and *curvipes*, Fabr., presenting as he thought an intermediate conformation between *Tabanus* and *Chrysops*. The described species are all from S. America, with the exception of *D. ferrugatus* from N. America, *D. scutellata* from Central America, and *D. flavipennis* from the Philippines. Loew distinguishes it from *Lepidoselaga* and *Selasoma* by the absence of metallic colouring or scales and from *Tabanus* by the curved fore tibiæ. Osten Sacken considers it is only distinguished from *Tabanus* by the shortness of the face, the rather low insertion of the antennæ, and the rather broad fore tibiæ, the coloration of the eyes also differing from that of *Tabanus*, at least in *D. ferrugatus*. The greater length of the first joint of the antennæ, the general appearance, more slender build, and the markings of the wings seem to sufficiently distinguish it from *Tabanus*, in addition to the curved dilated fore tibiæ, as also the absence of any tooth or real projection on the third joint of the antennæ. In this respect the species of this genus may be confused with the smaller *Tabani*, in some of which the projection or angle of the third joint is very slight, so that there is very little difference in the shape of the third joint. Bigot thus confused specimens of a North-American *Tabanus* and called it *D. hæmatopotides*.

The five species placed in this genus by Bigot all belong to

other genera. His *D. maroccanus*, ♂ (Mém. Soc. Zool. Fr. v. p. 623, 1892), from Morocco, is a male species of *Silvius*, but I am not able to identify it with any description of a *Silvius* from the Palæarctic Region, many of the males of the described species being not yet known; the eyes are hairy in this specimen, and the face and the second joint of the antennæ moderately pubescent: his *D. barbatus*, ♂ (*l. c.* p. 622), from Piedmont, is also a male species of *Silvius* with the face and the first two joints of the antennæ densely pubescent; the eyes are bare: his *D. hæmatopotides*, ♀ (*l. c.* p. 624), from N. America, is a specimen of *Tabanus fratellus*, Will.: his *D. melas*, ♀ (*l. c.* p. 625), from Sidney, is a specimen of *Apocampta subcanus*, Wlk. (see Ric. Ann. & Mag. Nat. Hist. (7) viii. 1901, p. 287): his *D. notatus*, ♀ (*l. c.* p. 622), from California, is a species of *Silvius* apparently identical with *Silvius quadrivittatus*, ♀, Say, Journ. Acad. Phil. iii. p. 33 (1823); id. Compl. Wr. ii. p. 54 (1859); Wiedem., Auss. zweifl. Ins. i. p. 200 (1828) (*Chrysops*); Osten Sacken, Cat. Dipt. N. Amer. p. 226 (1878); Will. Trans. Kans. Acad. Sci. x. p. 131 (1888).

Williston distinguishes his species *S. pollinosus* from Say's species by the absence of blackish stripes on the thorax; these are present in Bigot's specimen. Williston suggests that these two species may belong to the genus *Nemorius*. Bigot's specimen certainly bears a strong general resemblance to *Chrysops* (*Nemorius*) *vitripennis*, Mg., though the first joint is considerably longer in *C. vitripennis*, as Williston remarks.

The latter author describes a species as *Dichelacera scutellata* from Brazil, but suggests it may belong to the genus *Diachlorus*, though the fore tibiæ, not being curved, seem to exclude it from this genus, and the absence of a tooth on the third joint of the antennæ from *Dichelacera*. If it should be finally placed under *Diachlorus*, the name will have to be changed, being already used for a species described by Macquart.

Diachlorus varipes, Rondani, is said by the author to be nearly related to *D. atœnia*, Macq., which is a synonym of *D. ferrugata*, F.

The species named by Walker *Diachlorus varius*, ♂, belongs to the Pangoninæ, having ocelli, and spurs on hind tibiæ; the antennæ being lost, it is impossible to identify it further, but it probably belongs to the subgenus *Diatomineura* and comes from Chili. In List Dipt. pt. v. Suppl. 1, p. 269, Walker notes that the fore tibiæ are straight and slender, thus differing from other species of the genus.

The *Diachlorus guttatulus* described by Townsend in Trans. Kansas Acad. Sci. xiii. p. 134 (1892), is referred by him to the genus *Tabanus* in 'Psyche,' viii. p. 147 (1897). With the elimination of the Bigot and other species mentioned above, the described species of *Diachlorus* are reduced to fourteen, not including Williston's doubtful species.

D. ferrugatus, ♀, Fabr., Syst. Antl. p. 111 (1805) (*Chrysops*); Wiedem., Dipt. Exot. i. p. 94 (1821); id. Auss. zweifl. Ins. i. p. 186 (1828) (*Tabanus*); Walker, List Dipt. i. p. 191 (1848); id. ib. pt. v. Suppl. 1, p. 148 (1854) (*Dichelacera*); Ost. Sack. Mem. Boston Soc. ii. p. 396 (1876); id. Cat. Dipt. N. Amer. 1878, p. 55; id. Biol. Centr.-Amer., Dipt. i. p. 57 (1886); Williston, Biol. Centr.-Amer., Dipt. i. Suppl. p. 263 (1900); Hine, Ohio State Univ. Bull. (7) no. 19, p. 23 (1903). [*Tabanus americanus*, Pal. Beauv., Ins. Dipt. p. 223, pl. iii. fig. 6 (1805–1821). *Diabasis atœnia*, Macq., Dipt. Exot. i. p. 152 (1838); Walker, List Dipt. pt. v. Suppl. 1, p. 271 (1854). *Chrysops convergens*, Walker, *l. c.* *Chrysops approximans*, Walker, List Dipt. i. p. 198 (1848). *Tabanus Rondanii*, Bell., Ditt. Messicana, i. p. 168, pl. ii. fig. 11 (1859).]—North America.

D. curvipes, ♀, Fabr., Syst. Antl. p. 107 (1805) (*Hæmatopota*); Wiedem., Dipt. Exot. i. p. 90 (1821); id. Auss. zweifl. Ins. i. p. 176 (1828) (*Tabanus*); Macq., Hist. Nat. Dipt. i. p. 208 (1834); Walker, List Dipt. pt. v. Suppl. 1, p. 271 (1854) (*Diabasis*). [*Chrysops varipes*, Walker, List Dipt. pt. v. Suppl. 1, p. 289 (1854); Ric., Ann. & Mag. Nat. Hist. (7) viii. p. 309 (1901).]—South America.

D. bicinctus, ♀, Fabr., Syst. Antl. p. 102 (1805); Wiedem., Auss. zweifl. Ins. i. p. 191 (1828) (*Tabanus*); id. Dipt. Exot. i. p. 105 (1821) (*Chrysops*); Macq., Hist. Nat. Dipt. i. p. 207 (1834); Walker, List Dipt. pt. v. Suppl. 1, p. 270 (1854) (*Diabasis*).—Brazil.

D. podagricus, ♀, Fabr., Syst. Antl. p. 108 (1805); Wiedem., Dipt. Exot. i. p. 98 (1821); id. Auss. zweifl. Ins. i. p. 219 (1828); Macq., Hist. Nat. Dipt. i. p. 212 (1834) (*Hæmatopota*); Macq., Dipt. Exot. i. p. 151 (1838); Walker, List Dipt. pt. v. Suppl. 1, p. 269 (1854) (*Diabasis*).—Brazil.

D. globicornis, ♀, Wiedem., Dipt. Exot. i. p. 96 (1821); id. Auss. zweifl. Ins. i. p. 190 (1828) (*Tabanus*); Macq., Hist. Nat. Dipt. i. p. 208 (1834); Walker, List Dipt. pt. v. Suppl. 1, p. 271 (1854) (*Diabasis*).—Brazil.

D. glaber, ♀, Wiedem., Auss. zweifl. Ins. i. p. 192 (1828) (*Tabanus*); Macq., Hist. Nat. Dipt. i. p. 208 (1834); Walker, List Dipt. pt. v. Suppl. 1, p. 270 (1854) (*Diabasis*).—Brazil.

D. bivittatus, ♀, Wiedem., Auss. zweifl. Ins. i. p. 151 (1828) (*Tabanus*); Macq., Hist. Nat. Dipt. i. p. 212 (1834) (*Hæmatopota*); Walker, List Dipt. pt. v. Suppl. 1, p. 270 (1854) (*Diabasis*). [*Chrysops ornatus*, Walker, List Dipt. i. p. 199 (1848); Ric., Ann. & Mag. Nat. Hist. (7) viii. p. 309 (1901).]—Brazil.

D. scutellatus, ♀, Macq., Dipt. Exot. i. p. 151, pl. xviii. fig. 2 (1838); Walker, List Dipt. pt. v. Suppl. 1, p. 269 (*Diabasis*).—Cayenne.

D. fuscipennis, ♀, Macq., Dipt. Exot. i. p. 152 (1838); Walker, List Dipt. pt. v. Suppl. 1, p. 271 (1854) (*Diabasis*).—Brazil.

D. interruptus, ♀, Macq., Dipt. Exot. i. p. 152 (1838); Walker, List Dipt. pt. v. Suppl. 1, p. 271 (1854) (*Diabasis*).—Brazil.

D. diversipes, ♀, Macq., Dipt. Exot. Suppl. 3, p. 13 (1846); Walker,

List Dipt. pt. v. Suppl. 1, p. 270, pl. i. fig. 5 (1854) (*Diabasis*); Wulp, Notes Leyden Museum, vii. p. 81 (1885).—Brazil.

D. flavipennis, ♀, Macq., Dipt. Exot. Suppl. 4, p. 35 (1850); Wulp, Cat. Dipt. S. Asia, p. 64 (1896) (*Diabasis*).—Philippines.

D. ochraceus, ♀, Macq., Dipt. Exot. Suppl. 4, p. 36 (1850) (*Diabasis*).—Brazil.

D. varipes, Rondani, Studi Entom. di Baudi Truqui, i. p. 105 (1848) (*Diabasis*).—Brazil.

The following table is drawn up for the species contained in the British Museum collection :—

1.	Abdomen black. Wings with a dark band..	*scutellatus*, ♀, Macq.
	Abdomen yellowish. Wings with the apex dark	2.
2.	Abdomen with two black stripes	*bivittatus*, ♀, Wiedem.
	Abdomen with an indistinct yellow median stripe.....	3.
3.	Thorax yellow, with brown stripes. Wings with yellow fore border and stigma	*curvipes*, ♀, Fabr.
	Thorax not striped. Wings with brown fore border and stigma	*ferrugatus*, ♀, Fabr.

Diachlorus ferrugatus, ♀, F.

One female from Mexico.

Five females from Belize, Orange Walk, Brit. Honduras, presented by the Colonial Secretary; one female from Arroyos, Isidro (Townsend Coll.).

Type of *C. convergens*, ♀, Wlk., 284 (Miller Coll.).

Type of *C. approximans*, ♀, Wlk. (*Doubleday*), Florida.

One female from Panzos, Guatemala (*Champion*), Biol. Centr.-Am. Coll.

Diachlorus curvipes, ♀, ~~Wiedem.~~ Fabr.

Type of *Chrysops varipes*, ♀, Walker, from Para (Saunders Coll.), and another female from the same place (Bates Coll.); one female from St. Paul's (Bates Coll.), 59. 74; one female from Manaos, 12. 2. 96 (*Austen*); one female from Gurupa, 23. 1. 96 (*Austen*). In the Walker type the fore legs are not so dark as is usual in this species, being a faint yellowish brown. This species is nearly allied to *D. ferrugatus*, but may be distinguished by the brown stripes on the yellow-haired thorax, consisting of a brown stripe on each side, beginning on a level with the shoulders far from the fore border of the thorax, continued to the posterior border, with a branch diverging from it and running to the base of the wing, which is yellow on the fore border, with the apex more

widely brown than in *D. ferrugatus*, but the stigma is yellow, not brown, and the veins yellow; the legs are also paler, the base of the hind tarsi white besides those of the middle tarsi, as stated by Wiedemann.

Diachlorus bivittatus, Wiedem.

This species is easily distinguished from *D. ferrugatus*, to which it is very similar in general appearance and colouring, by the dark stripes on the abdomen, and the dark brown of the wing is not so extended at the apex.

Female type, *Chrysops inornatus*, Walker, from Brazil.

One female from Rio de Janeiro, 4. 7. 99 (*Dr. Lutz*), presented by C. B. Rhind, Esq.

Diachlorus scutellatus, ♀, Macq.

One female from British Guiana (*Low*), 1901.

The scutellum, described by Macquart as red or yellow, is so densely covered with grey tomentum that it appears grey, as does also the base of the thorax; there are traces of yellow pubescence on the grey colour; otherwise this specimen agrees with Macquart's description.

Stibasoma, Schiner.

Stibasoma, Schiner, Verh. zool.-bot. Gesellsch. Wien, xvii. p. 310 (1867); id. Reise Novara, p. 93 (1866); Ost. Sacken, Biol. Centr.-Am., Dipt. i. p. 57 (1886).

This genus is distinguished by the short, stout, strongly arched abdomen and the dilated curved fore tibiæ, which serve to separate it from *Tabanus*; the shape of the antennæ, with the third joint furnished with a tooth, and the absence of metallic scales or colouring distinguish it from *Selasoma* and *Lepidoselaga*. It was formed for *Tabanus theotœnia*, Wiedem., and all the species, except one from N. America, belong to S. America.

The described species number six.

S. theotœnia, ♀, Wiedem., Auss. zweifl. Ins. i. p. 136 (1828); Walker, List Dipt. pt. v. Suppl. 1, p. 200 (1854) (*Tabanus*); Schiner, Reise Novara, p. 94, pl. ii. fig. 6 (1866); Williston, Kans. Univ. Quart. iii. p. 194 (1895).—Monte Video, Brazil.

S. fulvohirtum, ♀, Wiedem. *l. c.* p. 155; Walker, List Dipt. pt. v. Suppl. 1, p. 150 (*Tabanus*); Schiner, Reise Novara, p. 94 (1866); Ost. Sacken, Biol. Centr.-Am., Dipt. i. p. 57 (1886). [*Tabanus compactum*, ♀, Walker, *l. c.* p. 222.]—Brazil, Amazons.

S. tristis, ♀, Wiedem., *l. c.* p. 164; Walker, *l. c.* p. 200 (*Tabanus*); Schiner, Reise Novara, p. 94 (1866).—Brazil.

S. dives, ♀, Walker, List Dipt. i. p. 166 (1848) (*Tabanus*).—Amazons.
S. bicolor, ♀, Bigot, Mém. Soc. Zool. Fr. v. p. 636 (1892).—Brazil.
S. pachycephalum, ♂, Bigot, *l. c.* p. 636.—Mexico.

1.	Black species. Abdomen yellow at base .	2.
	Black species, with the first two segments yellow at the sides	*bicolor*, ♀, Bigot.
	Species with black abdomen, the posterior borders of segments white-haired	*fulvohirtum*, ♀, Wiedem.
	Species with red-brown abdomen, the posterior borders of segments bright yellow-haired	*dives*, ♀, Walker.
2.	Wings black, lighter at apex	*theotœnia*, ♀, Wiedem.
	Wings yellow, smoky grey at apex	*tristis*, ♀, Wiedem.
	Wings clear, with two brown bands	*pachycephalum*, ♂, Bigot.

Stibasoma dives, ♀, Walker.

Type ♀, no locality given, and another female from Amazons (*Bates*), 66. 53.

A large-bodied species, distinguished by the bright yellow hairs on the hind borders of the segments. The type has lost its head, but there is no doubt of the identity of the other perfect specimen with it.

Face black, with black pubescence; the palpi and antennæ black, the latter with the long horn on the first ring of the third joint, and the short four remaining rings ending in a point; forehead black, narrow. Thorax and scutellum brown, with black pubescence on the dorsum and at the sides. Abdomen reddish brown with ferruginous pubescence, the hind border of each segment fringed with bright yellow hairs; underside of abdomen brown with the yellow bands distinct. Legs black with black pubescence, which becomes fringe-like on the fore and hind tibiæ. Wings grey, yellow at the base and on the fore border, with yellow veins.

Length 18 mm.

Stibasoma fulvohirtum, ♀, Wiedem.

Tabanus compactum, ♀, Walker.

Type of *T. compactum*, ♀, Wlk., from Ega, Amazons (*Bates*), 51. 43, and another female specimen from Panama (*Champion*), Biol. Centr.-Am. Coll.

The remarks by Schiner and Osten Sacken amending the original description certainly apply to the two specimens mentioned above.

Stibasoma pachycephalum, ♂, Bigot.

Two males (*not* females as stated by the author) from Mexico.

These probably belong to this genus and form a distinct species; but the antennæ being defective, it is impossible to speak with certainty; it is the only species of the genus as yet described with brown markings on the wings.

Stibasoma bicolor, ♀, Bigot.

Two females from Brazil.

This is a small black species, the first two segments of the abdomen yellow at the sides, the wings hyaline tinged with yellow at the base and on the fore border and with yellow veins. The long tooth on the third joint of the antennæ reaches the second ring, which, together with the remaining three, is small and short, the last one ending in a point.

Acanthocera, Macquart.

Acanthocera, Macq., Hist. Nat. Dipt. i. p. 209 (1834); Loew, Dipt. Südafrik. p. 31 (1860); Schiner, Reise Novara, p. 95 (1866).

This genus was not clearly defined by Macquart, who founded it on *Hæmatopota longicornis*, Fabr., which Loew states Macquart had never seen, and Schiner believes he had never seen any species belonging to the genus; he did not clearly distinguish it from *Dichelacera*, and actually redescribed a specimen of *Acanthocera longicornis*, F., as *Dichelacera longicornis*. Schiner gives the shape of the antennæ as the chief characteristic, being long and slender, the first joint nearly as long as the third, which is divided into nearly equal divisions; in *Dichelacera* the lengthened first joint is always shorter than the third.

Loew considers the true characters of the genus are:—the long, slender, nearly cylindrical body, the depressed head, the face with tubercles, the lengthened first joint of the antennæ, the great length of the third joint, hairy to the point, with a long tooth at its base, and the unusually great development of the last four divisions.

The tooth of the third joint of antennæ seems to vary from the long one in *A. longicornis* to a small one in *A. exstincta* and *A. coarctata*, if Wiedemann's descriptions are accurate. Schiner's statement that the first joint is nearly as long as the third will not hold good, at least in *A. marginalis*, Wlk.; the first joint is usually about twice the length of the second, but Schiner gives it as four times as long in his description of *A. trigonifera*.

The genus may be distinguished by the long, slender antennæ, the first joint long, which will distinguish it from *Dichelacera*, but not so long as the third, which is furnished

with a tooth; the long slender abdomen with yellow bands or spots, the wings marked with brown, and the whitish tibiæ or tarsi seem typical of the genus, at least for all the species as yet described.

There are five species known, all from South America:—

A. longicornis, ♀, Fabr., Ent. Syst. iv. p. 371 (1794); id. Syst. Antl. p. 103 (1805) (*Tabanus*); Wiedem., Dipt. Exot. i. p. 98 (1821); id. Auss. zweifl. Ins. i. p. 213 (1828) (*Hæmatopota*); id. Hist. Nat. Dipt. i. p. 209 (1834); Macq., Dipt. Exot. i. p. 114, pl. xvi. fig. 2 (1838) (*Dichelacera*); Walker, List Dipt. pt. v. Suppl. 1, p. 267 (1854). [*Hæmatopota triangularis*, Wiedem., Zool. Mag. iii. p. 44 (1819).]—Brazil.

A. exstincta, ♀, Wiedem., Auss. zweifl. Ins. i. p. 214 (1828); Walker, List Dipt. pt. v. Suppl. 1, p. 268 (1854); Loew, Dipt. Südafrik. p. 46 (1860).—Montevideo.

A. coarctata, ♀, Wiedem., Auss. zweifl. Ins. i. p. 578 (1828); Walker, List Dipt. pt. v. Suppl. 1, p. 295 (1854) (*Hæmatopota*); Bigot, Bull. Soc. Zool. Fr. xvi. p. 74 (1890).—Brazil.

A. marginalis, ♂, Walker, List Dipt. pt. v. Suppl. 1, p. 268 (1854).—Brazil.

A. trigonifera, ♀, Schiner, Reise Novara, p. 95 (1866).—South America.

1. Species with the tooth of the third joint of the antennæ small	2.
Species with the tooth of the third joint of the antennæ long.....	3.
2. Abdomen constricted at the base.....	*coarctata*, ♀, Wiedem.
Abdomen not so constricted	*exstincta*, ♀, Wiedem.
3. Wings black-brown, a clear spot in the middle, but no clear space between the apex and the anal cell.....	*trigonifera*, ♀, Schiner.
Wings with brown markings, the space between the apex and the anal cell clear.	4.
4. Wings with a dark band across the middle.	*longicornis*, ♀, F.
Wings with no such dark band	*marginalis*, ♂ ♀, Wlk.

Acanthocera coarctata, ♀, Wiedem.

Probably belongs to this genus, as Wiedemann states it belongs to the group comprising *A. longicornis* and *A. exstincta*, the tooth of the third joint of antennæ being more like that of the last-named species, of which he suggests it might be the other sex, yet he speaks of both the species as females only.

Acanthocera marginalis, ♂ ♀, Walker.

One female type from Para, Brazil (Bates Coll.), 51. 147; one male from River Amazons, Brazil (Bates Coll.), 66. 53; one female from same locality (Saunders Coll.), 73. 34; one female, Ega, River Amazons (Bates Coll.), 66. 53.

This species cannot be identical with *A. exstincta*, Wiedem.,

as Loew suggests, the tooth on the third joint of the antennæ in this type being long, not very short as Wiedemann states of *A. exstincta*; the brown apex of the anal cell is not mentioned by him in his description, and not all the segments of the abdomen are bordered with yellow in Walker's type.

Brown species with golden-yellow stripes on the thorax and bands on the abdomen, the wings almost wholly clear with no dark band across the middle of the wing. Face brown, under the antennæ shining brown, at the sides black with whitish tomentum, the forehead brown, the frontal callus above the antennæ triangular with the point towards the vertex, two grey stripes proceeding from the sides of the triangle meet at its apex. Antennæ longer than the thorax; the first two joints yellow with black pubescence, the first one long, the second barely half as long, cylindrical, the third nearly three times as long as the first joint, rufous at its base, then brown, the same width throughout, except at the extreme base where the tooth begins, where it is slightly broader, becoming narrower at its apex; the long tooth reaches the second ring, the last four rings being all of equal length, but together longer than the basal one. Thorax black-brown, two yellow stripes and a yellow spot at the side formed of yellow pubescence; the breast the same colour with a yellow stripe continued from the spot, with grey hairs and tomentum; scutellum yellow. Abdomen reddish brown, in the other specimens blackish brown with yellow pubescent bands on the posterior borders of the first two segments and a white pubescent band on the third; the white band is wanting in two of the specimens and is yellow in another; the pubescence on the dorsum black, some white hairs on the anterior segments, the underside with two white bands. Legs brown, the base of the anterior and posterior tibiæ, the whole of the middle tibiæ, and the first tarsal joint of all white, in some specimens the middle tibiæ are wholly brown or only white at the base. Wings with the fore border to the apex, the extreme base, and the apex of the anal cell brown.

Length 10 mm.

Acanthocera longicornis, ♀, Fabr.

Two females from Brazil.

Acanthocera trigonifera, ♀, Schiner, is described as a magnificent new species, the first antennal joint being nearly four times as long as the second, and the third distinctly longer than the first, the tooth reaching to the middle of the third joint.

Dichelacera, Macquart.

Dichelacera, Macq., Dipt. Exot. i. p. 112 (1838); Rondani, Nuovi Ann. Sci. Nat. Bologna, (3) ii. p. 192 (1850); id. Archiv. Canestr. iii. p. 78 (1863); Loew, Dipt. Südafrik. p. 31 (1860); Schiner, Reise Novara, p. 96 (1866).

This genus was formed by Macquart for the small group divided off from *Tabanus*, represented by *D. cervicornis*, *damicornis*, and *T-nigrum*, Wiedem., having a long tooth at the base of the third joint of the antennæ, all from S. America. In spite of his remark that this character was not distinctive of the genus, many South-American species of *Tabanus* possessing it (see Dipt. Exot. i. p. 113), other authors, especially Bigot and Walker, have indiscriminately placed any *Tabani* from S. America with the long tooth to antennæ in this genus, ignoring their dissimilarity in other respects to *D. cervicornis* &c. and their general *Tabanus*-like appearance. It would seem imperative to restrict to this genus (at least for the present till the South-American *Tabani* have been thoroughly worked out) the small group of which *D. cervicornis* is the type; these are distinguished as rather small flies of a long slender type, with a banded thorax and abdomen, and brown markings on the wings, with a slender third joint of the antennæ furnished with a tooth, and usually a rather lengthened first joint; these characteristics seem as yet all that divide them from *Tabanus*, though their general appearance and shape will easily distinguish them, as recognized by Loew.

Schiner distinguishes *Dichelacera* from *Acanthocera* by the rather lengthened first joint of the antennæ, which, together with the slender shape, he considers is the only safe distinction that divides it from *Tabanus*; the first joint being always shorter than the third, which is shaped and ringed as in *Tabanus*, with a long tooth at the base, will further distinguish it from *Acanthocera*.

Restricting the genus as suggested above, all Bigot's species (with the exception of *D. longirostris*, which is a species of *Silvius*) should be relegated to *Tabanus*, and will doubtless prove in many instances to be synonyms of previously described species from S. America. Of Walker's species, *D. bifacies*, *multifascia*, and *fasciata* will belong to *Dichelacera in sensu stricto*, the latter being a synonym of *D. cervicornis*; the remainder of his species will probably prove to belong to *Tabanus*. Of the Wiedemann species included in *Dichelacera*, some seem to have been placed there by Walker only, such as *D. flava* and *D. capreolus*, which may perhaps

more properly belong to *Tabanus*. *D. alcicornis* and *D. Januarii* may belong to the group represented by *D. cervicornis*, though the former is described as having stripes, not bands, on the thorax. Of the species described and placed by Macquart in his genus, I have seen only *D. marginata*, which resembles *D. cervicornis* in colouring &c. *D. unifasciata*, he states, is related to *D. alcicornis*, Wiedem., and *D. immaculata* to *D. flava*, Wiedem.; *D. binotata* and *D. longicornis* belong to the genus *Acanthocera*. *D. rufa*, he suggests, may be a variety of *D. Januarii*, Wiedem., but Rondani renamed it *Tabanus brasiliensis*. *D. testacea* and *D. fuscipennis* do not seem to have the typical colouring and shape of the *cervicornis* group. *D. scapularis* seems related, so far as the markings of the wing are concerned, to *D. marginata*, and from Bellardi's figure appears likely to belong to the genus *in sensu stricto*, though in colouring it is black.

Of Walker's species, *D. sparsa*, *repanda*, *prætereuns*, *transposita*, *vacillans*, and *abiens* will more properly belong to *Tabanus*. *D. fasciata* and *multifasciata* prove to be synonyms of *D. cervicornis*, *D. hinnulus* of *D. marginata*, and *D. bifacies* alone seems a distinct species. *D. nubipennis*, Rondani, has hairy eyes, apparently not usual in this genus, and from the description I should doubt its being correctly placed in this genus.

The following list includes the described species of *Dichelacera*, excluding those which appear more correctly to belong to *Tabanus*; one or two are inserted with a query as to which genus they belong:—

D. cervicornis, ♀, Fabr., Syst. Antl. p. 100 (1805); Wiedem., Dipt. Exot. i. p. 79 (1821); id. Auss. zweifl. Ins. i. p. 157 (1828); Macq., Hist. Nat. Dipt. i. p. 197 (1834) (*Tabanus*); Walker, List Dipt. pt. v. Suppl. 1, p. 153 (1854); Schiner, Reise Novara, Dipt. p. 94 (1866); Ost. Sack., Biol. Centr.-Amer., Dipt. i. p. 58 (1886); Will., ibid. Suppl. p. 263 (1900). [*D. fasciata*, ♀, Walker, Dipt. Saund. i. p. 68 (1848); Ost. Sack., Cat. N. Amer. Dipt. (1878) p. 55, note. *D. multifasciata*, ♀, Walker, *l. c.* p. 69.]—Central and S. America.

D. damicornis, ♀, Fabr., Syst. Antl. p. 101 (1805); Wiedem., Dipt. Exot. i. p. 87 (1821); id. Auss. zweifl. Ins. i. p. 159 (1828); Macq., Hist. Nat. Dipt. i. p. 97 (1834) (*Tabanus*); id. Dipt. Exot. i. p. 112 (1838); Walker, List Dipt. pt. v. Suppl. 1, p. 151 (1854).—Brazil.

D. T-nigrum, ♀, Fabr., Syst. Antl. p. 101 (1805); Wiedem., Auss. zweifl. Ins. i. p. 160 (1821) (*Tabanus*); Macq., Dipt. Exot. i. p. 112 (1838); Walker, List Dipt. pt. v. Suppl. 1, pp. 152, 325 (1854); Will., Kans. Univ. Quart. iii. p. 193 (1895), under *Tabanus T-nigrum*.—S. America.

D. Januarii, ♀, Wiedem., Zool. Mag. iii. p. 43 (1819); id. Dipt. Exot. i. p. 94 (1828); id. Auss. zweifl. Ins. i. p. 162 (1828) (*Tabanus*); Macq., Dipt. Exot. Suppl. 3, p. 10 (1848); Walker, List Dipt. pt. v. Suppl. 1, p. 153 (1854); Schiner, Reise Novara, Dipt. p. 95 (1866).—Brazil and Rio Janeiro.

D. alcicornis, ♀, Wiedem., Auss. zweifl. Ins. i. p. 158 (1828) (*Tabanus*);

Walker, List Dipt. i. p. 190 (1848); id. ib. pt. v. Suppl. 1, p. 154 (1854).—Brazil.

? *D. capreolus*, ♀, Wiedem., Auss. zweifl. Ins. i. p. 162 (1828) (*Tabanus*); Walker, List Dipt. pt. v. Suppl. 1, p. 152 (1854).—Brazil.

? *D. flava*, ♀, Wiedem., Auss. zweifl. Ins. i. p. 163 (1828) (*Tabanus*); Walker, List Dipt. pt. v. Suppl. 1, p. 153 (1854).—Montevideo.

D. immaculata, ♀, Macq., Dipt. Exot. i. p. 115 (1838); Walker, List Dipt. pt. v. Suppl. 1, p. 153 (1854).—Brazil.

D. unifasciata, ♀, Macq., Dipt. Exot. i. p. 115 (1838); Walker, List Dipt. pt. v. Suppl. 1, p. 155 (1854).—Brazil.

? *D. testacea*, ♀, Macq., Dipt. Exot. Suppl. 1, p. 29, pl. iii. fig. 10 (1846); Walker, List Dipt. pt. v. Suppl. 1, p. 153 (1854).—Colombia.

D. rufa, ♀, Macq., Dipt. Exot. Suppl. 2, p. 13 (1846); Walker, List Dipt. pt. v. Suppl. 1, p. 150 (1854). [? *Tabanus brasiliensis*, Rondani, Nuovi Ann. d. Sci. Nat. di Bologna, (3) ii. p. 192 (1850).]—Brazil.

? *D. fuscipennis*, ♀, Macq., Dipt. Exot. Suppl. 2, p. 14 (1846); Walker, List Dipt. pt. v. Suppl. 1, p. 150 (1854).—Brazil.

D. scapularis, ♀, Macq., Dipt. Exot. Suppl. 2, p. 15 (1846); Bellardi, Ditt. Messicana, i. p. 53, pl. ii. fig. 12 (1859); Walker, List Dipt. pt. v. Suppl. 1, p. 149 (1854); Osten Sacken, Cat. Dipt. N. Amer. p. 55 (1878); id. Biol. Centr.-Am., Dipt i. p. 59 (1886).—Mexico.

D. marginata, ♀, Macq., Dipt. Exot. Suppl. 2, p. 30 (1846); Walker, List Dipt. pt. v. Suppl. 1, p. 152 (1854). [*D. hinnulus*, Walker, Newman, Zoologist, viii. Append. cxxii. (1850); Walker, List Dipt. pt. v. Suppl. 1, p. 153 (1854).]—Cayenne, Para.

D. bifacies, ♀, Walker, List Dipt. i. p. 191 (1848).—Brazil.

? *D. nubipennis*, Rondani, Ann. Soc. Nat. Modena, iii. p. 39 (1868).—Mendoza, Argentine.

? *D. scutellata* (? *Diachlorus*), Williston, Kansas Univ. Quart. iii. p. 193 (1895).—Brazil.

D. pulchra, ♂ ♀, Williston, Biol. Centr.-Am., Dipt. i. Suppl. p. 263, pl. iv. figs. 22, 22 *a* (1900).—Mexico.

The following Walker species described under *Dichelacera* are replaced in *Tabanus* for the present, though some of the species are not so distinctively *Tabanus*-like in form and appearance as those of Bigot :—

Tabanus sparsa, ♀, Walker, Dipt. Saund. p. 71 (1846). A species with brown spotted wings.—Brazil.

Tabanus prætereuns, ♀, Walker, *l. c.* p. 70, pl. ii. fig. 6. With dark brown wings.—South America.

Tabanus vacillans, ♀, Walker, *l. c.*—Brazil.

Tabanus repanda, ♀, Walker, List Dipt. i. p. 190 (1848). With brown spots on the wings.—Venezuela.

Tabanus abiens, ♀, Walker, *l. c.* p. 191; O. S., Cat. Dipt. N. Amer. p. 55 (1878). Has no large tooth, only a slight projection on the third joint of the antennæ. The type is a female, not a male as stated by Walker.—W. Indies.

Tabanus transposita, ♀, Walker, List Dipt. pt. v. Suppl. 1, p. 151 (1854). Besides the type there are four other females presented by Theobald (coll. Rosenberg) from Ecuador. This species is not of the usual type of *Tabanus*, having a long slender abdomen.—The type is from the West Coast of America.

The Bigot species described under *Dichelacera* but not

belonging to this genus are the following; they all have a tooth on the third antennal joint:—

Tabanus pachypalpis, ♀, Bigot, Mém. Soc. Zool. Fr. v. p. 631 (1892). A large species.—Mexico.
Tabanus japonicus, ♀, Bigot, *l. c.* A smaller species.—Japan.
Tabanus satanicus, ♀, Bigot, *l. c.* A species with a dark red scutellum and brownish wings.—Brazil.
Tabanus castaneus, ♀, Bigot, *l. c.* The antennæ are broken off.—Brazil.
Tabanus marmoratus, ♀, Bigot, *l. c.* p. 633. These seem identical with *T. albopictus*.—Brazil.
Tabanus albopictus, ♀, Bigot, *l. c.* The wings have a brown band and a square brown spot on the fork of the third vein.—Brazil.
Tabanus peruvianus, ♀, Bigot, *l. c.* The wings have an irregular band.—Peru.

The species described by Bigot as *Dichelacera longirostris*, ♀, is a species of *Silvius* not previously described under this latter genus. I propose to redescribe it as

Silvius longirostris, ♀.

Dichelacera longirostris, ♀, Bigot, Ann. Soc. Entom. Fr. (3) vii. p. 128 (1859).

There are two females from Madagascar, either of which may have been Bigot's type. I have based my redescription on the one marked 35.

This species will come under those with a long tooth-like projection on the third joint of the antennæ after *S. pertusus*, Loew, in my table of species of *Silvius* from the Ethiopian Region (Ann. & Mag. N. H. 1901, viii. p. 295), thus:—

Brown. Legs dull yellow. Wings clear.

A brown species with clear wings and a rather long proboscis.

Face greyish yellow, shining brown under the antennæ, some silvery hairs bordering the eyes. Palpi long, yellow, with black pubescence; the proboscis as long as the anterior femora. Antennæ yellow, the third joint redder, becoming darker towards the apex; the first joint twice as long as the second, both with black pubescence; the tooth of the third joint is long, reaching the first of the annulations, curved, with fine hairs on its outer edge; the last ring is the longest of the four, ending in a point. Forehead reddish brown, narrow, consisting of a raised ridge along the whole length, the ocelli situated on it at the vertex. Thorax yellowish with four brown stripes; the sides and breast greyish with a few yellowish hairs; the scutellum brown. Abdomen brown, pale yellowish in the centre of the first segment and along the anterior border of the second segment; this paler colour appears on the other segments under the dark colour on the anterior border; the underside pale yellow, with some

dark shading of the brown colour. Legs dull yellow, the fore legs, all the femora, and the last four joints of the tarsi browner. Wings hyaline with a brown stigma, veins yellowish.

Length 10 mm.

Mr. Verrall has kindly presented these to the Natural History Collection (British Museum).

The following table is drawn up for the six species represented in the British Museum Collection :—

1.	Wings hyaline, with two brown half-bands united, or one brown band, and brown shading in the anal cell	2.
	Wings yellowish, with the apex and the inner border brown	*marginata*, ♀, Macq.
2.	Abdomen yellowish, with only the apex brown	*T-nigrum*, ♀, F.
	Abdomen yellowish or whitish, with brown bands.....	3.
3.	Legs black, the middle and fore tibiæ white.	*damicornis*, ♀, F.
	Legs yellowish	4.
4.	The band of the wing as two half-bands....	*cervicornis*, ♀, F.
	The band of the wing as one, with a brown stripe on the third longitudinal vein to border; tooth of antennæ very small	*bifacies*, ♀, Walker.
	The band of the wing as one, but no brown stripe; tooth of antennæ not small	*grandis*, ♀, sp. n.

Dichelacera cervicornis, ♀, Fabr.

One male from St. Paul's, Amazons (Bates Coll.), 59. 74 (it was labelled *D. brunivitta*, evidently a MS. species of Walker's).

One female type of *fasciata*, Wlk. (Saunders Coll.), 68. 4; one female type of *multifascia*, Wlk., from Para (Saunders Coll.), 68. 4; three females from the Amazons (Bates Coll.), 66. 53; one female from Brazil; one female from David, Chiriqui, Panama (*Champion*), Biol. Centr.-Am. Coll.

This is a species that seems to vary in size and colouring, as remarked by Osten Sacken in Biol. Centr.-Am., Dipt. i. p. 58, the colour varying from pale yellow to dark brown. Walker's *D. multifascia* is nothing but a large specimen of *D. cervicornis*, measuring 11 mm., and, as surmised by Osten Sacken, his *D. fasciata* is a specimen of this species.

Dichelacera damicornis, ♀, Fabr.

Two females from Para (Saunders Coll.), 68. 4; one female from Villa Nova, Amazons (Bates Coll.), 55. 75; one female from Para (Bates Coll.), 66. 53.

This species is distinguished from *D. cervicornis* by the yellow-brown shining tubercle on the face below the antennæ, and by the brown legs, with only the middle and anterior

tibiæ and the basal joint of the middle tarsi whitish. The wings may be more accurately described as having the fore border brown as far as the apex, and extending as a band across the wing through the upper half of the discal cell to the posterior border and anal cell, also prolonged on the third longitudinal vein and for one third of the length of the fifth longitudinal vein.

Dichelacera T-nigrum, ♀, Fabr.

One female from Santarem (Bates Coll.), 53. 72, with a label attached bearing the name *trifascia*, evidently a MS. name of Walker's.

There is another female from the forest, Santarem, Lower Amazons, 3. 96 (Austen Coll.), 96. 229, answering to the description of this species; but there are no brown spots on the third segment of the abdomen, which is yellow with a brown apex, and the thorax is more golden-haired than brown-haired as Wiedemann states.

Dichelacera marginata, ♀, Macq.

One female from Brazil (Bates Coll.), 49. 2; one female from Para (Wallace & Bates Coll.), 50. 2. These were described by Walker as *D. hinnulus*; I cannot distinguish which of the two is the type. One female from West Coast of America, from Surveying voyages of H.M.SS. 'Herald' and 'Pandora,' presented by Capt. Kellett and Lieut. Wood, R.N., 50. 12. Two females from Ecuador, 1903. 74 (Rosenberg Coll.), presented by Mr. Theobald.

The species described by Walker is apparently identical with *D. marginata*; the specimens from Ecuador are rather larger and the abdomen darker coloured. Macquart's type came from Cayenne.

The wings, rather vaguely described by Macquart, are hyaline, with the apex from just below the base of the fork of the third vein brown, which colour also extends over the apex of the discal cell and as far as the fifth posterior cell, and on the posterior border the apical cell is filled out with brown, but is yellow at its extreme base; the fore border is yellowish and the veins reddish yellow. The third joint of the antennæ, wanting in Macquart's type, is here yellowish at the base, brown on the upper half, the tooth long, reaching to the second ring; the last four rings are nearly all equal, with long hairs on the sides.

Dichelacera bifacies, ♀, Walker.

One female, type, from Para, presented by Mrs. T. P. G. Smith, 45. 56.

In the marking of the wings and the colouring of the abdomen and thorax this species is typical of the genus *in sensu stricto*, though the tooth of the third antennal joint is unusually small, it might be almost described as a spine, which is shorter than the basal portion of the antennæ below it, there are fine black bristles on its outer edge, and it ends in a sharp point; the last four divisions of the joint are together about the length of the first division, and are equal in size, the last one ending in a point, being a little longer, all bordered with fine black pubescence; the first two joints are yellow with black hairs, which are most conspicuous on the upper corner of the second joint; the third yellow, darker at the tip. Face yellow, shining under the antennæ; the palpi yellow, curved, with black pubescence; the frontal callus brown, shining, oval, reaching the eyes, with its apex on the anterior border towards the vertex. Thorax yellowish brown with a brown band; the shoulders, anterior border, and the part behind the brown band yellow-haired; the scutellum brown. The first two segments of the abdomen yellow with a brown median stripe; the third and fourth brown, each with a golden-yellow-haired band on the posterior border, equal in width to the brown part; the fifth with a narrow border of yellow hairs; the sixth brown; the underside yellow, brown at the sides and on the apex. Legs pale yellow, the hind legs browner.

Length 8 mm.

Dichelacera grandis, ♀, sp. n.

Three females from Belize, Orange Walk, British Honduras, Sept. 1899. Presented by the Colonial Secretary.

A large species distinguished from *cervicornis* by the shape of the band of the wing.

Face yellow, with an obscure black spot under the antennæ; the palpi yellow, long, curved, with black pubescence; the hairs under head scanty and yellow. Antennæ reddish yellow, the third joint black from the annulations, long, with a long tooth; the first joint twice as long as the second; the third stout, the tooth reaching the first annulation; all the annulations about equal in size. Forehead pale yellowish; the frontal callus dark brown, shining, almost square, a raised line runs from it to the vertex, which is dusky in colour.

The thorax yellowish, golden-haired, with a brown band in the centre; scutellum brown. Abdomen reddish brown, the first segment paler with golden hairs, the anterior borders of the other segments brown with reddish posterior borders covered with fulvous hairs; underside yellowish, the apex

brown. Legs reddish yellow, the posterior tibiæ and tarsi dark brown. Wings hyaline, the fore border brown, the band beginning from near the apex, crosses the fork of the third vein, and becoming narrower crosses the apex of the discal cell and ends in the fifth posterior cell; the apex of the anal cell and its interior border are brown.

Length 12 mm.

Ditylomyia, Bigot.

Ditylomyia, Bigot, Rev. et Mag. Zool. (2) xi. p. 305 (1859); id. Cat. Orient. Dipt. (1891); Wulp, Cat. Dipt. S. Asia, p. 63 (1896).

This genus was formed for one species from Ceylon, which, however, on examination, proves to be a specimen of *Gastroxides*, Saunders, a genus in the division Pangoninæ: see Ricardo, Ann. & Mag. Nat. Hist. (7) viii. pp. 289, 297 (1901). (*G. ater*, ♀, Saunders, *l. c.* pl. v. fig. 4; ♂, Saunders, *l. c.* &c., should read thus, not as printed on page 298.)

Gastroxides ornata, ♀, Bigot.

Ditylomyia ornata, ♀, Bigot.

The type, by the markings of the wings and the general shape of the abdomen, bears a general resemblance to *Gastroxides ater* (Saunders), the only heretofore known species of the genus. Bigot mentions the presence of ocelli, but did not note the spines on the hind tibiæ, these two characters dividing the division Pangoninæ from Tabaninæ. The antennæ have only five rings on the third joint, not eight or nine as he supposes. In the shape of the head, the insertion of the antennæ, and the presence of the tubercles on the forehead it resembles *G. ater*, but is larger and of different colouring.

Black, with lighter hind borders to the segments of the abdomen.

Face blackish, with grey tomentum, the tumid triangular projection in the middle shining red-brown; the palpi large, flat, as long as the proboscis, dark brown with black hairs. Forehead black, shining, with two prominent tubercles, one situated near the antennæ, the other about in the middle of the forehead, neither reaching the sides; vertex reddish; the yellow ocelli are placed on a brownish, not very prominent tubercle bordered with grey which is continued along the sides of the forehead. Antennæ longer than the head, red-brown, the long spine or tooth brighter red; the first joint stout, long, the second only half as long, both with black pubescence; the third joint twice as long as the first, its first ring as long as the remaining four together, stout, bearing the long spine at its base, the second ring is the

smallest, the third and fourth about equal, the fifth as long as the last two together. The hairs below the head are blackish. Thorax reddish brown, with indistinct grey tomentum and two yellowish stripes; the scutellum yellowish red; the breast reddish, with brown tomentum and black pubescence. Abdomen black, long and pointed; the second segment widest, the first and third with yellow, the second and fourth with grey hind borders, the remaining segments black with some red on the sides; underside black. Legs reddish brown with black pubescence, the fore femora stout. Wings dark brown with clear base; a clear band in the middle crossing the base of the discal cell and extending to the fifth posterior cell, another on the apex crossing the fork of the third longitudinal vein; there is also a clear space in the anal cell, and the axillary part of the wing is clear.

Length 18 mm.

Through the kindness of Mr. Verrall this species is now placed in the British Museum Collection with the species for which the genus *Gastroxides* was formed.

L.—*On some* Coccidæ *in the Collection of the British Museum.* By E. Ernest Green, F.E.S.

In the comprehensive 'Catalogue of the Coccidæ of the World' by Mrs. M. E. Fernald is a list of some sixty species "without description or not recognizable."

Of these, the following five names are cited from the Catalogue of the British Museum, Homoptera (1852), and credited to Walker, whose descriptions were too often inadequate for recognition:—

1469. *Coccus caudatus.*
1489. —— *poterii.*
1492. —— *sinensis.*
1502. *Lecanium australe.*
1503. —— *capense.*

I have been given an opportunity of examining the types of these species contained in the British Museum collection, with the following result:—

No. 1469. *Coccus caudatus,* Walker, Cat. Brit. Mus., Hom. p. 1085.

Represented in the National Collection by a single male, which is an unmistakable Monophlebid. The antennæ have typical whorls of hair on the nodes. There are no fleshy caudal processes. Walker speaks of abdominal bristles about five times the length of the body; but any such appendages have now disappeared. The existing characters suggest that the so-called bristles were probably in the form

of tufts of glassy filaments, such as occur in the males of *Icerya*, *Callipappus*, &c.

Walker's published description is as follows:—

"*Mas. Gracilis, nigra, albo lanuginosa: antennæ filiformes, corpore duplo longiores: abdominis setæ longissimæ: pedes setosi: alæ cinereæ.*"

"Male. Black, slender, with a thick white covering: feelers filiform, bristly, about twice the length of the body: bristles of the abdomen about five times the length of the body: legs bristly: wings gray. Length of the body 3 lines: of the wings 4 lines. Columbia. From Dr. Cuming's collection."

No. 1489. *Coccus poterii*, Walker, Cat. Brit. Mus., Hom. p. 1082; Ray, Hist. Plant. i. p. 401; Kirby and Spence, Intr. Ent. i. p. 318 (4th ed.).

Walker's species is not now and never was represented in the collection. So far as Walker is concerned, the appellation is a "nomen nudum." It would appear to have been invented by that author to provide a name for the insect alluded to (*loc. cit.*) by Kirby and Spence in the following sentence:—"A similar neglect has attended the *Coccus* found on the roots of *Poterium sanguisorbi*." Kirby himself seems to have referred to the following note by Ray (*loc. cit.*):—

"*De Pimpinella sanguisorba. . . . Hujus radicis adnascitur quibusdam in locis granum rubrum, quo utuntur tinctores ad colores carmesinum, unde sunt qui pro cocco habent, et Coccum radicum appellant.*"

This reference suggests identity with *Margarodes polonicus*, Linn. (the *Chermes radicum purpureus* of Geoffroy), a species said to produce a purple-red dye (*v.* Signoret, 'Essai sur les Cochenilles,' p. 417).

No. 1492. *Coccus sinensis*, Walker, Cat. Brit. Mus., Hom. p. 1085.

This is represented in the collection by a series of adult females in fairly good preservation, a single mutilated male, and a mass of prepared wax labelled "Insect wax of China."

I have no hesitation in identifying this material with *Ericerus pela* (Chav.).

Walker's diagnosis of *Coccus sinensis*, transcribed below, does not agree with the characters of the female in any particular, and has probably been drawn up from the male larva or nymph. It reads as follows:—

"*Picea. Elliptica: dorsum lanugine alba dense vestitum: pedes ferruginei.*"

"Pitchy, elliptical, thickly covered above with woolly matter: feelers submoniliform, slightly setaceous: the joints successively increasing in length: legs ferruginous, hairy. Length of body 2 lines. China. Presented by G. T. Lay, Esq."

No. 1502. *Lecanium australe*, Walker, Cat. Brit. Mus., Hom. p. 1079.

The type of this species has unfortunately been lost, and no clue remains as to its identity. Walker's diagnosis, here appended, is quite inadequate :—

"*Rufum, ellipticum, transverse rugosum.*"

"Red, elliptical, transversely rugose. Length of body 1½ line. Van Diemen's Land. Presented by the Rev. T. Ewing."

No. 1503. *Lecanium capense*, Walker, Cat. Brit. Mus., Hom. p. 1079.

The following diagnosis (*loc. cit.*) gives little assistance in the identification of the species :—

"*Piceum, transversum, conchiforme, transverse striatum.*"

"Conchiform, pitchy, a little broader than long, with transverse striæ, which are parallel to the broader side. Breadth 1 line. Algoa Bay. Above 200 specimens on bark. Presented by Dr. Pereira."

Fortunately the Museum Collection contains ample material from which I have been able to determine the insect as an undescribed species of *Aspidiotus* and to append the annexed formal description.

Aspidiotus (*Aonidiella*) *capensis* (Walk.).

Lecanium capense, Walker, Cat. Brit. Mus., Hom. p. 1079 (1852).

Female puparium subcircular or oval, moderately convex, very dense and somewhat rough and corrugated. Colour deep chocolate-brown, in some examples inclining to reddish. Pellicles reddish, situate close to anterior margin, the second often concealed. Ventral scale dense, whitish. Longer diameter 2 to 2·50 mm.

Male puparium small, narrow, tapering slightly to posterior extremity. Colour and texture as in female; posterior extremity slightly paler. Length 1·25 mm.; breadth 0·50 mm.

Adult ♀.—Dried examples deep purple-brown. Broadly oval. A conspicuous submarginal series of long stout hairs on cephalothorax (fig. 1, p. 376). Rudimentary antennæ with several stout curved bristles. A ventral series of from four to six stout blunt spines on each side, each spine arising from a

Fig. 1.



Fig. 2.



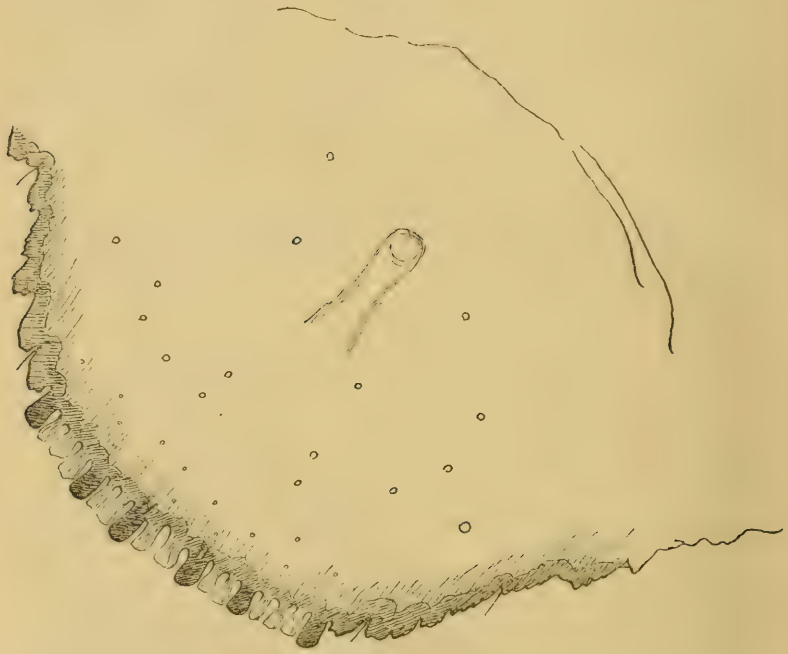
Fig. 3.



Fig. 5.



Fig. 4.



Aspidiotus capensis.

Fig. 1.—Early adult ♀, ventral view.
Figs. 2, 3.—Ventral spines of adult ♀.
Fig. 4.—Pygidium of adult ♀.
Fig. 5.—Marginal squames.

conspicuous circular plate (figs. 2, 3), those on thoracic area much smaller than the others. These spines are easily detachable and are often missing, especially in older examples, when the circular base remains and has the appearance of a large circular pore. Pygidium (fig. 4) normally with six stout, prominent, bluntly rounded lobes. In some examples the lobes are very irregularly developed, one or more being often missing. Margin beyond the lobes strongly incrassate and irregularly cristate. Paraphyses more or less obscured by and merged in the thickened margin. Squames broad, stout, truncate, almost as large as the lobes, not fimbriate, apparently tubular, with a deep cleft on one side of the tube (fig. 5). No circumgenital glands. Some minute circular pores scattered irregularly over the surface of the pygidium. Length 0·75 to 1·50 mm.

On undetermined plant. Algoa Bay. Collected by Dr. Pereira.

Allied to *Aspidiotus cladii*, Mask., which it resembles closely in colour and texture of puparium and in nature of pygidial squames, but from which it may be separated by the much shorter paraphyses and more conspicuous lobes of the pygidium.

Lecanium (*Paralecanium*) *expansum*, var. *metallicum*, Green.

Lecanium expansum, Green, "Catalogue of Coccidæ," Ind. Mus. Notes, vol. iv. no. 1 (1896); Coccidæ of Ceylon, part iii. p. 235 (1904).
Lecanium expansum, var. *metallicum*, Green, "On some Javanese Coccidæ," Ent. Month. Mag., Sept. 1904, p. 205.

The collection contains some beautiful examples of a *Lecanium* from Singapore that, in favourable lights, displays a wonderful iridescent golden film on the dorsum. Microscopic examination proves the insect to be identical with *L. expansum*, var. *metallicum* (*loc. cit.*), though these specimens are even more iridescent than the typical examples from Java. They were collected by Mr. H. N. Ridley, of the Singapore Botanic Gardens, on *Myristica* (nutmeg).

I have also received on loan from Mr. R. Newstead, of Chester, a single specimen of what is evidently the same species and variety, though I have been unable to examine it microscopically. This specimen is labelled "On shrub in Jungle, Malay Peninsular, Butsib Berar, 2500 ft. Coll. Annandale, 28, VIII. 01."

The dorsum in all the examples is distinctly marked with polygonal plates, as in the type. In those from Singapore the centre of each plate is bare of the golden film; but in the single example from the Malay Peninsula only the marginal series of plates shows this character, the discal plates

being completely coated. Prepared specimens show the stippled margin noted in typical examples of the variety. All the specimens are broadly oval, narrowed at anterior extremity. Length varying from 6 to 8·50 mm., and breadth from 5 to 7 mm.

LI.—*Five new* Rhinolophi *from Africa.*

By Knud Andersen.

In working out a revision of the Ethiopian species of the genus *Rhinolophus* I find the following new forms in the collection of the British Museum to need description :—

Rhinolophus empusa, sp. n.

Short diagnosis.—Anterior upper and middle lower premolars placed in the tooth-row. Sella wedge-shaped (deltoid). Horseshoe as broad as muzzle. A conspicuous dark patch under each eye. Forearm 48 mm.

Nose-leaves.—Horseshoe covering the muzzle laterally; a small tooth-like projection on each side of median notch; underlying leaf easily visible all round. Sella wedge-shaped; breadth at base about three fourths of vertical height; lateral margins plainly converging (with a scarcely perceptible constriction in the middle) towards the summit, which is subacutely pointed. Posterior connecting-process long, pointed, slightly curved forwards, as an erect horn, about five sixths the vertical height of the sella, thus projecting far beyond the summit of the sella. Lateral margins of lancet concave in the middle, tip behind constriction about 2·3 mm.

Ears.—Rather short, scarcely reaching tip of muzzle, when pressed forwards along the sides of the head. Tip obtusely pointed. Outer margin concave below the tip. Notch on outer margin shallow, almost rectangular. Extreme breadth of ear somewhat greater than the distance from the notch to the tip.

Wings.—5th metacarpal longer than 4th. 1st joint of 4th finger equal to three fifths the length of 1st joint of 3rd finger. On the folded wing the tip of the 1st joint of the 5th finger reaches as far back as the posterior point of the elbow; tip of 1st joint of the 3rd finger falling only a trifle short of the same point. Plagiopatagium inserted at base of metatarsus.

Tail.—Much longer than tibia, about the same length as the combined 1st and 2nd joints of the 4th finger. Tip of tail projecting 2 mm. beyond the membrane (a character

which, however, no doubt will prove to be subject to a certain amount of individual variation). Hinder border of interfemoral, between tips of calcars, almost square.

Colour (of spirit-specimen).—Light brown above, greyish beneath. Sides of face yellowish white, with a strongly marked dark brown patch under each eye. Membranes dark brown; free margin of plagiopatagium very narrowly bordered with whitish. Forearm, metacarpals, and finger-joints yellowish.

Skull.—Essential characters as in *Rh. Blasii*, but parietal region of skull still more globular; frontal region considerably less constricted. Extreme width of brain-case slightly greater than zygomatic width. Median anterior point of palatal bridge opposite front of m^1; median posterior point drawn out into a tooth-like projection. Upper margin of mandible from condyle to base of coronoid process almost straight. Coronoid process very small, projecting only a trifle beyond the highest cusp of m_1.

Dentition.—Small anterior upper premolar (p^2) placed in the tooth-row. Upper canine and posterior premolar (p^4) widely separated. Cusp of p^4 three fourths the height of the canine. Middle lower premolar (p_3) extremely small, but *placed entirely in the tooth-row*, separating p_2 and p_4 from each other; p_2 one third the height of the canine. Cusp of lower p_4 not quite as high as the antero-exterior cusp of m_1.

Type.— ♀ ad. Zomba, Nyasa, collected by Mr. A. Whyte, Jan. 1893, presented by Sir Harry Johnston. B.M. no. 93. 7. 9. 33.

Distribution.—Only one specimen, the type, examined.

Remarks.—This fine species stands quite alone among the African *Rhinolophi*, being the only hitherto known species with a wedge-formed sella. Its nearest ally is the South European *Rh. Blasii*. In dentition *Rh. empusa* occupies a slightly more *primitive* position than *Rh. Blasii*: in the former the lower p_3 is still entirely in the tooth-row, in the latter it is just on the point of being driven out on the exterior side of the tooth-row.

Measurements of the type.

	mm.
Nose-leaves:	
Front of horseshoe to posterior point of lancet	13·8
Extreme width of horseshoe	9
Vertical height of sella	3·1
Width of sella at base	2·3
Ears:	
Base of lower margin to tip	15·2
Notch on outer margin to tip	11·8
Extreme width	13·2

	mm.
Wings:	
Forearm	48
3rd finger, metacarpal	30·8
„ 1st joint	15·7
„ 2nd joint	24
4th finger, metacarpal	33·7
„ 1st joint	9
„ 2nd joint	15
5th finger, metacarpal	35
„ 1st joint	11
„ 2nd joint	12
Tail, from anus	25·3
Tibia	20·2
Hind foot (c. u.)	9·8
Skull:	
Extreme length	19·8
Basal length	15·2
Extreme width of brain-case	9·3
Zygomatic width	9
Maxillar width, across outer margin of m^3	6·1
Orbital constriction	2·8
Palatal bridge	2·6
Med. post. point of palate to front of premaxilla	6·2
„ „ „ for. magnum	9
Mandible, condyle to front of incisors	13·1
Teeth:	
Front of upper canine to back of m^3	6·5
Front of lower canine to back of m_3	6·8

Rhinolophus augur, sp. n.

Short diagnosis.—Apparently allied to *Rh. ferrum-equinum*, but readily distinguished by its much smaller ears and shorter tail. Forearm 54–57 mm.

Nose-leaves.—Horseshoe not covering muzzle laterally. Sella pandurate, as in *Rh. ferrum-equinum*, but decidedly narrower. Posterior connecting-process triangular, obtusely pointed, its upper margin straight, shorter than the vertical height of sella. Lateral margins of lancet deeply emarginate.

Ears.—Not reaching tip of the muzzle, when laid forward. Tip attenuated and acutely pointed. Outer margin strongly concave below the tip of the ear. Greatest width of ear equal to its length from notch on outer margin to tip.

Wings.—General characters as in *Rh. ferrum-equinum*, but forearm on the average shorter, its *maximum* length (57·2 mm. in a series of 15 specimens) being almost exactly like mean measurements in *Rh. ferrum-equinum* (57 mm., 31 specimens from Europe). 5th metacarpal slightly longer than 4th. 2nd joint of 3rd finger almost twice the length of 2nd joint of 5th finger. In the folded wing, tip of 1st joint of 3rd and 5th fingers opposite posterior point of elbow. Plagiopatagium inserted at the tarsal joint.

Tail.—Much shorter than in *Rh. ferrum-equinum*, its length (31·3 mm. on average) being almost exactly the same as the 2nd joint of 3rd finger (30·7 mm.); in *Rh. ferrum-equinum* much longer (36·7 against 29·5 mm.). Hinder border of interfemoral, between tip of calcars, slightly triangular.

Colour (16 skins).—General colour above "drab," with a tinge of fawn. Individual hairs "ecru-drab" at base, drab at tip. On the middle of the back an ill-defined (in some individuals scarcely perceptible) horseshoe-shaped patch, approaching "wood-brown"; branches of this patch on the shoulder-region, convexity backwards. Length of hairs on middle of back about 7·5 mm. Underside bright ecru-drab, more or less tinged with vinaceous buff on the breast and sides of the body. Ears (dried) transparent brown, membranes dark brown. Adult individuals vary but very slightly in colour, some being more greyish, others more fawn in hue. Young specimens (5 skins) are much duller coloured; fur above greyish brown; horseshoe-patch on back indicated, but rather indistinct; below bright grey, with a slight rosy tinge.

Dentition.—Essentially as in *Rh. ferrum-equinum.* Upper *c* and p^4 closely approximated, their cingula actually touching each other or separated only by an almost hair-fine interspace. Upper p^2 minute, blunt, placed in the outer angle formed by *c* and p^4, hardly rising to the level of the cingulum of the canine; this small tooth is present in all of the fourteen skulls examined, but will no doubt be found wanting in very old individuals with much-worn teeth (cf. *Rh. augur zambesiensis*). Upper p^4 as high as two thirds of the canine. Lower p_2 one third of p_4. Lower p_3, when present, extremely small, placed on the external side of the tooth-row, blunt, as high as the cingulum of p_4; in nine out of fourteen skulls examined this tooth is wanting, and every trace of the alveole has disappeared; in a tenth specimen (adult) the tooth is wanting on both sides, but the left alveolus is still to be traced: in the remaining four skulls p_2 is present on both sides; three of these latter are skulls of *young* bats, the fourth of an apparently adult individual, though still with almost unworn teeth. As proved by these facts, the presence or absence of p_3 in this species varies *individually*, without any bearing on differences in geographical distribution: of six specimens from the same cave, taken by the same collector and in the same season of the year, two have lost both the tooth and every trace of the alveolus, while in four specimens it is present on both sides; evidently it is most often to be found

in *young* individuals, more rarely in full-grown, perhaps never in very old. Lower p_4 a little higher than antero-exterior cusp of m_1.

Measurements.—Below under *Rh. augur zambesiensis*.

Type.—♂ ad. (skin). Kuruman, Bechuanaland, 4000 feet, collected by Mr. R. B. Woosnam, April 19th, 1904. B.M. no. 4. 10. 1. 1. Original no. 26. "Caught in an old mine; of fifteen taken there was only one female."

Distribution.—Specimens have been examined from the following localities:—Zuurbron, Wakkerstrom, S. Transvaal (1 specimen in alcohol); De Kaap, S. Transvaal (2, alcohol); near Krügersdorp, S. Transvaal, 4900 feet (6 skins); "Transvaal" (1, alcohol); Vredefort Road, N. Orange River Colony (1, alcohol; 2 skins); Kuruman, Bechuanaland, 4000 feet (8 skins). It will probably be found generally distributed over the whole of that part of South Africa which is irrigated by the Orange River and its confluents ("Orange River Area," in the zoogeographical sense of that term).

Remarks.—The present species has been confused with *Rh. ferrum-equinum* and *Rh. capensis* to such extent that it will be difficult to disentangle its synonymy without examination of the specimens recorded in literature. *Rh. capensis* differs mainly in the following points:—It is much smaller: forearm 49·5 mm. (average of eleven specimens), against 56 in *Rh. augur*; the ears much longer (20·5 mm. from base of inner border) and broader (16·7 mm.); tip of the ear obtusely pointed; sella only very slightly narrowed in the middle, its lateral margins subparallel in their upper half; posterior connecting-process shorter, its upper margin concave; all metacarpals and finger-joints much shorter, therefore the wing very much narrower in antero-posterior direction; even a badly prepared skin of *Rh. capensis*, in which the shape of the ears and nose-leaves is unrecognizable and the length of the tail not to be relied upon, can *always* be at once distinguished from *Rh. augur* by taking the measurement of the 2nd joint of the 3rd finger (22–26 mm., against 28·7–32 in *Rh. augur*); the tail remarkably short (20·8 mm.), only about the same length as the tibia, far shorter than the 2nd joint of 3rd finger, &c. The skull of *Rh. capensis* is slightly smaller; the nasals more swollen; the auditory bullæ larger; the basioccipital therefore still narrower; the tympanic ring larger. As far as the available material goes, *Rh. capensis* seems to be restricted to the *western part of the Cape Colony*, as far north as the mountains on which the coast-rivers spring, eastwards to Winter-Bergen.

Rh. augur bears, in fact, much more resemblance to *Rh. ferrum-equinum*. The differences between the two species have already been pointed out above. Whether, however, this resemblance is indicative of true relationship, or rather of convergence owing to similar habits and similar effects of natural surroundings, is open to question. It is in this connexion worth while mentioning that no doubt all the previous records of the occurrence of *Rh. ferrum-equinum* in Africa south of the Mediterranean subregion rest on confusion with other species; that, consequently, the two species, at the present time at least, are separated from each other by almost the whole of the tropical region of Africa.

Rhinolophus augur zuluensis, subsp. n.

Short diagnosis.—A small and darker-coloured race of *Rh. augur*. Forearm 51·2–54·5 mm.

Colour (8 skins).—Fur above approaching "wood-brown." Horseshoe-patch on back nearest to "russet." Beneath light "drab," tinged with pinkish buff on the sides of the body.

Measurements.—See table under *Rh. augur zambesiensis*.

Type.— ♀ ad. (skin). Jususic Valley, 20 miles N.W. of Eshowe, Zululand, 1000 feet, collected by Mr. C. H. B. Grant, Nov. 17th, 1903, presented by C. D. Rudd, Esq. B.M. no. 4. 5. 1. 8. Original no. 602. "Caught in old gold-driving."

Distribution.—Specimens examined:—King William's Town (1, in alcohol); Port Natal (1, alcohol); typical locality (8 skins). This race will probably be found generally distributed over the whole of the Natalese Province, southwards to Winter-Bergen, northwards to about the latitude of Delagoa Bay, westwards to the mountain-range in which the coast-rivers rise.

Remarks.—The obvious difference in size and colour, combined with the distinct geographical distribution, entitle this form to subspecific rank. It cannot be confounded with young individuals of the typical form: young *Rh. augur* are greyish brown above, bright grey with a slight rosy tinge beneath; *Rh. a. zuluensis*, owing to a stronger development of the darker-coloured tips of the hairs, next to wood-brown above, light drab beneath.

Rhinolophus augur zambesiensis, subsp. n.

Short diagnosis.—Very dark-coloured. In size somewhat intermediate between *Rh. augur* and *Rh. a. zuluensis*. Forearm 53·3–54·8 mm.

Colour (1 skin).—In the two forms just described the more or less distinct dark zone on the back takes the form of a horseshoe-patch. In the present race this patch extends over the whole of the back, giving the upperside of the animal an almost uniform brown colour, approaching "mummy-brown." Underside light "drab," somewhat darker in shade than in *Rh. a. zuluensis*. Ears and membranes (dried) black; in spirit-specimens the ears are "raw umber," the wings blackish brown.

Dentition.—The only skull examined is of a very old individual with much-worn teeth; both upper p^2 and lower p_3 are wanting, and no trace of their alveoli is to be seen. In younger individuals the dentition will no doubt be found to agree with that of the other races.

Type.—♂ ad. (skin). Fort Hill, N. Nyasa, about 9° 40′ S., 33° 20′ E., collected by Mr. A. Whyte, July 1896, presented by Sir Harry Johnston. B.M. no. 97. 10. 1. 18. Original no. 136.

Distribution.—Specimens examined:—Mazoe, Mashonaland, 17° 30′ S., 23° 30′ E. (3, in alcohol); Zomba, Nyasa, 15° 30′ S., 35° 30′ E. (1, alcohol); and the type.—From these localities it may be supposed that the present form is generally distributed over the whole of the area which is irrigated by the Zambesi and its confluents.

Remarks.—As will be seen from the above, the three forms of *Rh. augur* just described are characteristic of three distinct zoogeographical districts of S. Africa:—*Rh. augur* of the Orange River District (in wider sense); *Rh. a. zuluensis* and *zambesiensis* of the areas from which I have derived their names *.

Rhinolophus simulator, sp. n.

Short diagnosis.—Small upper premolar separating the canine and posterior premolar. In outer aspect somewhat like a peculiarly small and long-tailed *Rh. capensis*. Forearm 43·5–45 mm.

Nose-leaves.—Horseshoe as in *Rh. capensis*; underlying leaf distinct, under the margin of the horseshoe. Sella longer (higher) and slightly broader than in *Rh. capensis*; constriction below the middle very shallow; lateral margins subparallel in their upper half; summit broadly rounded off; width at summit equal to half the vertical height of sella.

* I am very glad to see these facts in perfect accordance with the zoogeographical subdivision of this part of S. Africa as proposed, five years ago, by Professor Matschie in his admirable book 'Die Megachiropteren des Berliner Museums für Naturkunde' (Berlin, 1899, p. 40).

Measurements of Rh. augur *and subspecies.*

	Rh. augur.		*Rh. a. zuluensis.*		*Rh. a. zambesiensis.*	
	Type.	Average of 15 spcms.	Type.	Average of 8 spcms.	Type.	Average of 5 spcms.
	mm.	mm.	mm.	mm.	mm.	mm.
Nose-leaves:						
Front of horseshoe to posterior point of lancet..	..	13·3	..	13·1	..	13·4
Extreme width of horseshoe	..	7·9	..	7·6	..	8·3
Ears:						
Base of inner margin to tip.	..	18·8	..	18	..	18·6
Notch on outer margin to tip	..	14·4	..	13·8	..	13·2
Extreme width	..	14·6	..	14·3	..	14·5
Wings:						
Forearm	55·8	55·9	52	52·6	53·3	54
3rd finger, metacarpal	36	36·8	34·5	34·8	32	34·6
„ 1st joint	18·1	18·4	17·8	17·5	18·1	18·1
„ 2nd joint.....	31	30·7	27	28·3	28·8	29·2
4th finger, metacarpal	39	40·4	38·3	38	38·7	39·1
„ 1st joint	11·4	11·6	11·3	11·3	11·8	11·2
„ 2nd joint.	19	18·9	17	17·4	19·8	19
5th finger, metacarpal	41·5	41·3	39·4	39	39·7	40·1
„ 1st joint	13·9	13·9	12·8	13·1	14·8	13·5
„ 2nd joint.....	15·5	15·7	14·1	14·7	16·2	15·9
Tail, from anus	..	31·3	..	29	..	32·5
Tibia	..	23·6	..	22·3	..	23·4
Skull:						
Extreme length	22·8	22·7	22·1	22·4	22·7	
Basal length	18·3	18·4	17·8	18	18·1	
Extreme width of braincase	10·2	10·2	10	10·1	10	
Zygomatic width	11·9	11·8	11·7	11·7	11·7	
Width across outer margins of m^3	8·8	8·5	8·2	8·2	8·2	
Orbital constriction	2·9	2·7	2·8	2·8	2·8	
Palatal bridge	2·2	2·2	2·2	2·2	2·3	
Med. post. point of palate to front of premaxilla.	7·2	7·1	7	7	7	
Med. post. point of palate to for. magnum	11·1	11·3	10·8	11	11·1	
Mandible, condyle to front of incisors	15·2	15·3	14·7	15	15	
Teeth:						
Front of upper canine to back of m^3	8·8	8·4	8·1	8·2	8	
Front of lower canine to back of m_3	9·2	9	8·8	8·9	8·8	

Posterior connecting-process very short, rounded off above, scarcely projecting beyond the summit of sella (this kept in vertical position). Margins of lancet abruptly narrowed; tip of lancet behind constriction with slightly converging (nearly parallel) margins, about 2 mm. in length.

Ears.—Large; reaching far beyond the tip of the muzzle, when placed along the sides of the head. Tip of ears obtusely pointed, as in *Rh. capensis*. Outer margin strongly concave below tip. Notch on outer margin shallow, obtuse. Extreme width of ear somewhat greater than the distance from notch to tip.

Wings.—General form as in *Rh. capensis*, but all dimensions markedly smaller. 4th metacarpal slightly longer than 5th. In the folded wing the tip of the 1st joint of 4th finger reaches very nearly the posterior point of the elbow; tip of 1st joints of 3rd and 5th fingers slightly beyond. Plagiopatagium inserted at basal joint.

Tail.—Considerably longer than in *Rh. capensis*, uropatagium therefore much broader. Hinder margin of uropatagium, between tips of calcars, square (concave in *Rh. capensis*, on account of the shorter tail). Tip of tail projecting about 1 mm.

Colour (1 skin).—Exactly as in *Rh. augur*. Length of hairs on middle of back about 8 mm. Young individuals (1 skin) considerably duller than adult ones; details exactly as in *Rh. augur*, juv.

Skull.—Very different from that of *Rh. capensis*:—Much smaller. Nasal swellings unusually prominent; nasal region deeply hollowed out behind swellings; for both these reasons the facial portion of the skull, from the swellings to crista sagittalis, more concave than in *Rh. capensis*. Palatal bridge much broader: median anterior point opposite front of m^1, in *Rh. capensis* opposite middle of the same molar.

Dentition.—Widely different from that of *Rh. capensis*:—Distance between tips of upper canines 3·8 mm., in *Rh. capensis* 5 mm. Upper canine and p^4 distinctly separated from each other, also internally; distance between tips of these teeth 2·1 mm.; in *Rh. capensis*, although the skull is much larger, 1·9 mm. Upper p^2 placed in the tooth-row, with a minute cusp distinctly projecting above the cingulum of canine. Highest cusp of p^4 somewhat more than half the height of canine. Inner lobes of molars less developed than in *Rh. capensis*: m^2 as long as broad, in *Rh. capensis* decidedly broader than long. Right p_3 extremely minute, in the outer angle formed by the cingula of p_2 and p_4;

cingula of these latter in immediate contact internally; left p_3 wanting, without any trace of the alveolus.

Type.—♂ ad. (in alcohol). Mazoe, Mashonaland, collected by J. ff. Darling, Esq. B.M. no. 2. 2. 7. 10.

Distribution.—Besides the type specimen I have seen only two skins, from the same locality and the same collector.

Remarks.—Owing to our still very defective knowledge of the Ethiopian *Rhinolophi*, the true affinities of this interesting species are somewhat obscure. I have compared it with *Rh. capensis*, only because it, by quite superficial inspection, could be taken for a curiously small and long-tailed form of that species. The totally different skull and dentition prove that it, in fact, has nothing to do with *Rh. capensis*, but, most probably, is to be regarded as an aberrant member of the *Rh. Landeri* group. It cannot be confounded with any other species; *Rh. Landeri*, *lobatus*, and *Denti* may, apart from many other differences, at once be distinguished by their very narrow sella.

Measurements.

	♂ ad., type. mm.	♂ ad., typical locality. mm.
Nose-leaves:		
Front of horseshoe to posterior point of lancet	13·7	
Extreme width of horseshoe	8·3	
Width of sella at base	2·4	
„ „ summit	2·2	
Ears:		
Base of inner margin to tip	20	
Notch on outer margin to tip	13·2	
Extreme width	14·5	
Wings:		
Forearm	43·5	45
3rd finger, metacarpal	30	30·8
„ 1st joint	13·6	14·5
„ 2nd joint	22·9	22·8
4th finger, metacarpal	33·2	34
„ 1st joint	8·1	8
„ 2nd joint	14·8	13
5th finger, metacarpal	32·2	33·3
„ 1st joint	10·7	10·5
„ 2nd joint	12·5	12
Tail, from anus	25·7	
Tibia	19·2	
Skull:		
Basal length	..	15·1
Extreme width of brain-case	..	9·1
Zygomatic width	..	9
Maxillar width across outer margins of m^3	..	6·2

	♂ ad., type. mm.	♂ ad., typical locality. mm.
Skull (*con.*):		
Orbital constriction	..	2·4
Palatal bridge	..	2·7
Med. post. point of palate to front of premaxilla	..	6
Med. post. point of palate to for. magnum	..	9·1
Mandible: condyle to front of incisors	..	12·3
Teeth:		
Front of upper canine to back of m^3	..	7
Front of lower canine to back of m_3	..	7·5

BIBLIOGRAPHICAL NOTICE.

Smithsonian Institution: United States National Museum. Special Bulletin. American Hydroids.—Part II. *The* Sertularidæ. With 41 Plates. By Charles Cleveland Nutting, Professor of Zoology, University of Iowa. Washington: Government Printing Office, 1904. Sm. fol. Pp. 151. Index, pp. 316–325.

The first volume of this work included the Plumularidæ, which had been supposed to be a much larger family than the Sertularidæ, of which latter family only about 20 American species had been mentioned in any single work. But by bringing together the scattered literature and by the description of upwards of 30 new forms Prof. Nutting has been able to describe and in most cases to figure as many as 130 species in the present work. We are pleased to see that he has been largely assisted by contributions of specimens and literature by the authorities of the British Museum (for portions of a number of Allman's 'Challenger' types) and numerous co-workers in Europe and America.

The work commences with an essay (with good text-illustrations) on the Morphology of the Sertularidæ, which is considered to be zoologically a lower family than the Plumularidæ, and which has hitherto been somewhat neglected. The various classifications are then discussed, and tables of genera and of the geographical distribution of the species are given. Then follows the systematic portion of the work, with full descriptions of the genera and species, the latter being tabulated under each genus and afterwards dealt with under the heads of Synonymy, Trophosome, Gonosome, Distribution, and Remarks. The collection in which the type is contained is also frequently indicated. The work concludes with an annotated Bibliography, a list of works to which reference is made in the synonymy in the systematic part of this work, but which have not been consulted by the author, and the explanation of plates, preceding the plates themselves. It forms a handsome volume, and appears to be an excellent piece of work.

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LII.—*Jurassic Brachiopoda.* By S. S. Buckman, F.G.S.

It is hoped that the following notes on certain genera and species of Jurassic Brachiopoda may be of service in regard to some technical points of nomenclature. Several of them are the result of investigations undertaken to ascertain what were the correct descriptions by which certain species in the collection at the British Museum (Natural History) should be classified. Such investigations are too often of a snowball character—the revision of nomenclature in one case opening a wider and wider field of inquiry.

Genus—Orthotoma, Quenstedt, 1871.

As the genotype Quenstedt names *Terebratula heyseana*; but what he figures under this name is not the same species as that figured by Dunker. Therefore *Terebratula heyseana*, Quenstedt (non Dunker), is properly the genotype of *Orthotoma*, and what this is may be seen from Handbuch Petref. 1851, pl. xxxvii. fig. 47, to which he refers.

The external characters of the genus *Orthotoma* are sharp beak-ridges, small foramen, and a tendency to sulcate the dorsal valve, while showing through the test should be the mark of a short septum. The dorsal sulcus is not always found in the later species, *O. anglica*; it is often seen in

young examples, and is sometimes preserved in the adult, but in many cases it has disappeared.

There are only a few species of the genus, and they may be recorded in the following manner. The method employed is a suggestion for a palæontological dictionary, to give in the most concise form information concerning types. The symbols employed are :—

T.d. (Type-description): Reference to the first description of the species, quoting the original name. *T.f.* (Type-figure): Reference to figure of holotype, or what is now selected as holotype out of cotypes. *N.* (Name): Where the present specific designation was given, in a case of renaming. *T.l.* (Type-locality): The place from which the holotype or the specimen figured as standard of reference came, so that it may be known what are topotypes, for they are of the greatest importance, next to types, for specific determination. *H.* Horizon, in author's words—modern interpretations or corrections in square brackets. *η.* Hemera. *Coll.* Collection in which the type specimen was recorded by the author—its present resting-place if different, and known, to be noted in square brackets.

Genus—Orthotoma, Quenstedt, 1871.

Genotype, *Terebratula heyseana*, Quenstedt (non Dunker)=*Orthotoma Quenstedti*, nom. nov. q. v.
Ref.: Petref. Deutschl. ii. p. 315.

1. *Orthotoma anglica* (Oppel).

T.d. 1856. Oppel, Juraf. p. 425; *Terebratula anglica.*
T.f. 1854. Davidson, Ool. & Lias Brach. (Pal. Soc.) pl. A. fig. 10 (figs. 10–13).
T.l. Dundry [Somerset].
H. "Inferior Oolite" [Aalenian].
η. [*Murchisonæ.*]
Coll. Bristol Museum.
Emend.: S. Buckman, Dundry Hill, Q. J. G. S. 1896, vol. lii. p. 702.

2. *Orthotoma heyseana* (Dunker).

T.d. 1847. Dunker & Meyer's Palæont. Beitr. z. Naturg. i. p. 129; *Terebratula heyseana.*
T.f. Ibid. pl. xviii. fig. 5.
T.l. Heinberg, near Göttingen.
H. "With *Terebr.* [*Rhynch.*] *rimosa*" [Pliensbachian].
Syn. *Terebratula Bakeriæ*, Davidson.

Remarks.—There are two specimens in the Mantell Collection at the British Museum, no. 24188, which are topotypes and perhaps metatypes. They have great likeness to *Terebratula aspasia*, var. *minor*, Zittel (*Glossothyris*), but they differ in regard to the beak; that possesses decided ridges which are wholly wanting in the beak of *T. aspasia.*

The ridges suggest that *T. heyseana* is a long-looped form and belongs to the Dallininæ, so that *Orthotoma heyseana* and *Glossothyris minor*, Zittel, are really homœomorphs.

The holotype of *Terebratula Bakeriæ*, Davidson, is in the British Museum (*Miss Baker Coll.*), no. B. 15078, and has the same beak-characters as *T. heyseana*. In fact, it must, I think, be regarded as a synonym, as Oppel pointed out years ago *. But there is only this one specimen in the Museum, and I do not know another anywhere else. Its record "Inferior Oolite" is evidently a mistake.

3. *Orthotoma Quenstedti*, nom. nov.

T.d. 1851. Handb. Petref. p. 471; *Terebratula heyseana* (non Dunker).
T.f. Ibid. pl. xxxvii. fig. 47.
T.l. Hinterweiler.
H. "Lias δ. Amaltheenthone" [Pliensbachian].
η. [*Margaritati.*]
Note.—Non *T. heyseana*, Dunker. Quenstedt's little circular shell differs decidedly from Dunker's transverse form.

4. *Orthotoma reclusa* (Quenstedt).

T.d. Eudes-Deslongchamps, Pal. franç., T. Jur. Brach. p. 113 (pars); *Terebratula* (*Waldheimia*) *heyseana.*
T.f. Ibid. pl. xxiv. fig. 1.
N. Petref. Deutsch. ii. p. 313; *Terebr. reclusa.*
T.l. Alais (Gard).
H. "Lias moyen, Niveau de la *T. numismalis*" [Pliensbachian].
η. [? *Armati.*]

5. *Orthotoma toarciensis*, nom. nov.

T.d. Pal. franç., Brach. Jur. p. 183; *Terebratula* (*Waldheimia*) *Lycetti* (pars).
T.f. Ibid. pl. xlvii. figs. 5, 6.
T.l. Verrines, near Thouars (Deux Sèvres).
H. "Marnes à *A. thouarsensis*" [Toarcian].
η. [*Striatuli.*]
Coll. Eudes-Deslongchamps [Prof. Bigot, Caen].
Note.—Non *T. Lycetti*, Dav., 1851 = *Ornithella Lycetti*; non *T. Lycetti*, Eud.-Desl. pl. xlvii. fig. 7 = *Ornithella Oppeli*; non *Waldheimia Lycetti*, Dav., 1878 = *Pseudoglossothyris banburiensis*, nom. nov. q. v.

The species referred to above, between which and the others there has been some confusion, mainly on amount of homœomorphy, are now given.

* Davidson himself notes the likeness, but says that Dunker's name was published in the same year (1851) as his own Appendix p. 17.

6. *Ornithella Lycetti* (Davidson).

T.d. Ool. & Lias Brach. (Pal. Soc.) vol. i. p. 44; *Terebratula Lycetti*.
T.f. Ibid. pl. vii. fig. 17.
T.l. Barrington, near Ilminster [Somerset].
H. Upper Lias [Toarcian].
Coll. [? Moore and ? Bath Museum.]

Remarks.—I have examined the specimens in the British Museum (*Davidson Coll.*), no. B. 6906, claimed to be the figured types of *Terebratula Lycetti*; but I cannot admit this claim except in the case of perhaps fig. 21. Davidson gives the size of his example for fig. 17, which shows that this is figured the natural size; none of B. 6906 are of these dimensions. A label in Davidson's handwriting accompanies the specimens, saying "These are the types"; but I am under the impression, from correspondence with him, that he was wont to use the word "type" where we should now say "topotype," and there are instances in his collection which fully support this view.

The British Museum specimens are all Terebratuloids; they have a circular foramen touching the umbo (rudimentary deltidial plates in one case), no beak-ridges, and no sign of septum. Davidson in regard to fig. 17, which must be taken as the holotype, so clearly shows Dalliniform beak-characters *, that we must accept them, and range *T. Lycetti* in the Dallininæ, especially as we know that there are such forms with Dalliniform beak-characters in the Upper Lias. Davidson's figs. 20, 21 are obviously Terebratuloids.

7. *Ornithella Oppeli* (S. Buckman).

T.d. 1896. S. Buckman, Q. J. G. S. vol. lii. p. 702; *Zeilleria Oppeli*.
T.f. Eudes-Deslongchamps, Brach. Jur., Pal. franç. pl. xlvii. fig. 7.
T.l. Verrines, près Thouars (Deux Sèvres).
H. "Niveau de l'*A. opalinus*" [Aalenian].
η. [*Aalensis* or *opaliniformis* or *scissi*?]
Coll. Sorbonne.

8. *Pseudoglossothyris banburiensis*, nom. nov.

T.d. Below.
T.f. Davidson, Trias. & Jur. Brach. (Pal. Soc.), Suppl. pl. xxiv. fig. 30. (*Waldheimia Lycetti.*)
T.l. "Bloxham, near Banbury."
H. "Upper Lias" [Toarcian].
η. [*Falciferi*?]
Coll. Mr. James Griffin.

Description.—A small circular Terebratuloid, its dorsal

* In the Jurassic genera *Ornithella, Zeilleria, Cincta, Plesiothyris*, the peculiar beak-characters being found associated with a long loop and a septum, the former may be taken as the outward index of the latter.

valve with a broad shallow sulcus; the beak without definite ridges; the foramen round.

Remarks.—Topotypes kindly given to me some years ago by Mr. E. Walford, F.G.S., show that this form is really a Terebratuloid, and has not the septum nor the form of beak-ridges and foramen characteristic of Jurassic Dallininæ. It is a homœomorph of *Orthotoma toarciensis* (= *T. Lycetti*, E.-Deslong.), which does show these features, and, moreover, occurs nearly at the same horizon, so that mistake is easy.

The sulcate dorsal valve suggests that the present species is an early form of the genus *Pseudoglossothyris*, a genus which is in character allied to the Nucleatæ, and is not one of the Biplicatæ. Davidson's figs. 20, 21 of pl. vii. vol. i., cotypes of *T. Lycetti*, probably belong to the present species; at any rate they must be removed from *Ornithella Lycetti* (Dav.).

Terebratula (*Waldheimia, Zeilleria*) *perforata*, auct.

Certain species which have been known by the trivial name *perforata*, coupled with the generic names given above, would perhaps be better assigned provisionally to *Ornithella* than to *Zeilleria*. Probably they belong to neither genus, but require a new designation; the same remark applies to the species described above, assigned to *Ornithella*: this point, however, cannot be settled till there be information concerning internal details. At present, vice *Waldheimia* discarded through prior use, there are the generic names *Ornithella* and *Zeilleria* for these forms. They are not *Microthyris*, and certainly not *Orthotoma*, nor *Cincta*.

Eudes-Deslongchamps used the name "*Terebratula perforata*, Piette," although he admitted that the designation *T. perforata* had already been applied to a Tertiary shell. So Piette's name must fall. The same author says that he has refigured, in his pl. xi. fig. 1, Martin's type of *T. strangulata* as *T. perforata*. If so, Martin's figure is bad. But taking Eudes-Deslongchamps's word for it, then *T. strangulata*, Martin, is a much larger form than what is known in England as *T. perforata*.

But our Lower Lias shell had been named long before Piette or Martin wrote; for it is the type of d'Orbigny's *T. sarthacensis*. Why this was overlooked by Davidson, Deslongchamps, and others is probably because d'Orbigny placed the species in his Toarcian, and also gave a reference which caused confusion. He quoted *T. ornithocephala*, Sow., pl. ci. fig. 5, which in our English work appears wrong.

But Mr. C. D. Sherborn, to whom I am indebted for much bibliographic assistance, and whose invaluable help I gladly acknowledge, solved the difficulty. He pointed out that d'Orbigny was quoting from the French edition of Sowerby (by Agassiz), wherein the figures of the plates were renumbered—often in misapprehension of Sowerby's intention, it may be noted. But pl. ci. fig. 5 of the French edition equals pl. ci. fig. 4 of the original: it depicts the shell from the Lias of Pickeridge. That becomes the type of *T. sarthacensis*: it does not matter that d'Orbigny assigned it to another formation, or that he probably confounded with it various other species.

R. Tate in 'The Yorkshire Lias' (Tate and Blake) rightly stated the case about d'Orbigny's *T. sarthacensis*, only he did not explain that author's quotation of fig. 5 instead of fig. 4. So Davidson was still much puzzled (*vide* remarks Suppl. Jur. Brach., Pal. Soc. pp. 165, 166) and he retained the name *perforata*. Tate again was quite right in his statement that Davidson had figured the wrong fossil (namely *T. ornithocephala*, Sow., fig. 4 = *T. sarthacensis*, d'Orb.) as Sowerby's type of *T. obovata*. For, spite of Davidson's protests (Suppl. p. 166), his pl. v. fig. 16 shows that he has done this.

Tate mentions *T. hispidula*, Simpson, as a Middle Lias shell very near to *T. perforata*; in fact, he classes it as such under the name *T. sarthacensis*. But such Middle Lias shells as I have seen like this are separable by a broader form and a rather larger foramen.

Another *perforata*-like form occurs in the Middle Lias: it was figured by Quenstedt as *T. numismalis ovalis*. It is distinguished by a larger foramen and by not showing a squared front margin. These are exactly the characters which d'Orbigny quotes as distinguishing his *T. crithea* from *T. sarthacensis*, so that there is little doubt that *T. crithea* is the designation for this Middle Lias shell. True, d'Orbigny places it in Toarcian, but he cites many other Middle Lias shells in that stage.

The species may now be catalogued as under:—

9. *Ornithella crithea* (d'Orbigny), 1850.

T.d. 1850. d'Orbigny, Prodrome, p. 258. no. 271; *Terebratula crithea*.
T.f. None.
T.l. Brulon.
H. "Toarcien," but *Rhynchonella tetraedia* and *Rh. thalia* are quoted from this same "Toarcien" [Pliensbachian].

Remarks.—We may take as *T.f.* of this shell *Terebratula*

numismalis ovalis, Quenstedt, Handb. Petref. pl. xxxvii fig. 27 (1852), from Lias γ. Osterdingen.

10. *Ornithella hispidula* (Simpson), 1855.

T.d. Foss. Yorks. Lias. p. 132. no. 9.
T.f. None.
T.l. Whitby.
H. Middle Lias (*armatus*-zone, Tate).
η. [*Armati.*]

Take as *T.f.* Tate and Blake's 'Yorkshire Lias,' pl. xv. fig. 11, which is acknowledged to be *T. hispidula* by Tate, and is a topotype.

Remarks.—This form has a squared front margin at an early age.

11. *Ornithella sarthacensis* (d'Orbigny), 1850.

T.d. None.
N. 1850. d'Orbigny, Prodrome, p. 258. no. 270; *Terebratula sarthacensis.*
T.f. 1815. Sowerby, Min. Conch. pl. ci. fig. 4; *Terebr. ornithocephala* (pars).
T.l. Pickeridge [Taunton, Somerset].
H. "Blue Lias (Marle)" [Hettangian].
η. [*Marmoreæ.*]
Coll. Sowerby [British Museum].

Type refigured, Davidson, Brach. vol. i. pl. v. fig. 16, as type of *T. obovata*, by mistake.

T. psilonoti, Quenstedt, is a synonym.

12. *Ornithella strangulata* (Martin).

T.d. 1860. Mém. Soc. Géol. France, sér. 2, vol. vii. p. 90; *Terebratula strangulata.*
T.f. Ibid. pl. vii. figs. 8, 10.
T.l. Semur.
H. "La lumachelle de Semur" [Hettangian].
Coll. Collenot.

T. marsupialis, Zieten, is a synonym.

Certain species affected by the foregoing remarks may now be noted.

13. *Epicyrta gallica*, nom. nov.

T.d. Eudes-Deslongchamps, Pal. franç., Ter. Jur. Brach. p. 130 (pars); *Terebratula* (*Waldheimia*) *sarthacensis.*
T.f. Ibid. pl. xxxi. fig. 3.
T.l. Bretteville-sur-Laize (Calvados).
H. Lias moyen [Pliensbachian].
Coll. Eudes-Deslongchamps [Prof. Bigot, Caen].

Remarks.—As Eudes-Deslongchamps's forms of *T. sarthacensis* do not agree with the figure cited by d'Orbigny it is necessary to rename. It seems to me that Deslongchamps has included species of more than one genus in his *T. sarthacensis*, like as are his figures 3 and 4. But his fig. 3 is a well-marked form showing, as he himself remarks, affinity to *T. Eugenii*: so I give a name to this form and suggest that it is the ancestor of *T. Eugenii*, which is the type of the genus *Epicyrta*. The incipient sulcation of the ventral valve might easily pass by tachygenesis into the complete sulcation characteristic of *Epicyrta Eugenii*. Deslongchamps's fig. 4 appears to be more allied to the *indentata* series; and it is not easy to imagine how fig. 4 could pass into *E. Eugenii*, it seems to be too far developed in another direction.

14. *Ornithella ornithocephala* (J. Sowerby).

T.d. 1815. Min. Conch. vol. i. p. 227 (pars).
T.f. Ibid. pl. ci. fig. 1, which refers to the left-hand top figure only. Type refigured, Davidson, Brit. Jur. Brach., Suppl. pl. xxii. fig. 1.
T.l. Chatley [Somerset, nr. Frome].
H. Cornbrash [Bathonian].
Coll. Sowerby [British Museum].

Remarks.—I have examined the three specimens in the British Museum marked as Sowerby's types and numbered 43,433. Fig. 1, depicted in the N.W. corner of Sowerby's plate, must be taken as the type of *Terebratula ornithocephala*. The specimen marked "fig. 2," which denotes the example depicted in two positions in the S.W. and N.E. portions of the plate, is a different shell. I feel doubtful if it is the figured example. It is of a dark blue colour: it may be Cornbrash; but it is negligible. Fig. 4 is type of *T. sarthacensis*, q. v.

Now the point is this: the fig. 1 of Sowerby's plate is not the same species as the Fullers' Earth fossil which has so long borne the appellation of *Terebratula* (or *Waldheimia*) *ornithocephala*; it differs particularly in its beak, and it is a broader shell.

Here it may be remarked that d'Orbigny in his 'Prodrome,' i. p. 316, applied the name *subtriquetra* to Sowerby's *T. triquetra*, as this term was already occupied by Parkinson. Sowerby's shell has been regarded as a variety of the Fullers' Earth *T. ornithocephala*, but as that is a mistaken identification the name *Ornithella subtriquetra* (d'Orbigny) will take priority. However, on these Fullers' Earth species I hope to say something further at another opportunity.

Summary.

Old Names.		New Names.
Terebratula Bakeriæ, *Dav.*	=	Orthotoma heyseana (*Dunk.*).
„ crithea, *d'Orb.*	=	Ornithella crithea (*d'Orb.*).
„ heyseana, *Eud.-Desl.* (pars).	=	Orthotoma reclusa (*Quen.*).
„ heyseana, *Dunk.*	=	„ heyseana (*Dunk.*).
„ „ *Quen.*	=	„ Quenstedti, *nom. nov.*
„ hispidula, *Simpson.*	=	Ornithella hispidula (*Simps.*).
„ Lycetti, *Dav.* (pars).	=	„ Lycetti (*Dav.*).
„ „ „ „	=	Pseudoglossothyris banburiensis, *nom. nov.*
„ „ *Eud.-D.* (pars).	=	Ornithella Oppeli (*S. Buckm.*).
„ „ „ „	=	Orthotoma toarciensis, *nom. nov.*
„ marsupialis, *Zieten.*	=	Ornithella strangulata (*Mart.*).
„ numismalis ovalis, *Quen.*	=	„ crithea (*d'Orb.*).
„ obovata, *Dav.* (pars).	=	„ sarthacensis (*d'Orb.*).
„ ornithocephala, *Sow.* (pars).	=	„ „ „
„ perforata, *auct.*	=	„ „ „
„ psilonoti, *Quen.*	=	„ „ „
„ sarthacensis, *Eud.-Desl.* (pars).	=	Epicyrta gallica, *nom. nov.*
„ sarthacensis, *Tate* (pars).	=	Ornithella hispidula (*Simps.*).
„ strangulata, *Martin.*	=	„ strangulata (*Mart.*).
„ triquetra, *Sow.*	=	„ subtriquetra (*d'Orb.*).
Waldheimia Lycetti, *Dav.* (pars).	=	Pseudoglossothyris banburiensis, *nom. nov.*

LIII.—*On some Mammals from British New Guinea presented to the National Museum by Mr. C. A. W. Monckton, with Descriptions of other Species from the same Region.*

By Oldfield Thomas.

The British Museum owes to the kindness of Mr. C. A. W. Monckton, Resident at Port Nelson, N.E. British New Guinea, a small collection of mammals obtained by him at about 8° 30′ S. lat., 148° E. long., and these prove interesting enough to deserve a list being published of them. In working them out I have also examined and made notes on some specimens sent by Mr. W. Stalker from the Gira district, further to the north-west (lat. about 8° 20′ S., long. 147° 30′ E.), and have in addition described a fine *Uromys* obtained many years ago by Mr. C. M. Woodford in the Solomon Islands, and a Dasyure from the Aroa River collected by Mr. Meek.

Unless otherwise stated, all the specimens mentioned are Mr. Monckton's.

Emballonura nigrescens, Gray.

♂. 53; ♀. 52. Gira River (*W. Stalker*).

The small size of these specimens confirms the recent separation * of *E. n. solomonis* from the typical form.

Mus ringens, Peters & Doria.

♂. 0, 5.

"Native name 'Kura.'"—*C. A. W. M.*

This is the Papuan representative of *Mus terræ-reginæ*, Alst., with which it may have to be united when enough material exists to justify the expression of a definite opinion. Both may be distinguished from their allies by the yellow mottling of the tail.

Mus mordax, sp. n.

♀. 16. 14th November, 1903. *Type*.—B.M. no. 4. 8. 3. 1.

"Native name 'Kaisi.'"—*C. A. W. M.*

Closely allied to *Mus prætor*, Thos., of which it appears to be the Papuan representative. Fur coarse, harsh, and spinous, with many longer bristles intermixed. General colour above of the same coarsely grizzled bistre-brown as in *prætor*, becoming rather more tawny on the rump. Under surface soiled clay-colour, the bases of the hairs dull slaty. Ears short, uniformly dark brown. Upper surface of hands and feet brown. Tail coarsely scaled, 9–10 scales to the cm.; dark brown throughout; its numerous hairs rather over one scale in length. Mammæ 2—2=8.

Skull broad, rounded, smoother and less heavily ridged than in *prætor*; supraorbital edges square, faintly beaded, the beading forming a distinct postorbital projection. In *prætor* the supraorbital ridges are evenly divergent, without postorbital projections, and are more strongly developed on the parietals. Palatal foramina parallel-sided, not or scarcely more widely open in the middle than at the posterior end, reaching back to the level of the front edge of m^1. In *prætor* the foramina are widely open at their middle, narrowing to sharp points behind as well as in front. Incisors unusually broad, smooth, and rounded in front, not specially deep antero-posteriorly. Below they are equally thick and their roots are carried up nearer to the coronoid notch than is the case in *M. prætor*.

Dimensions of the type:—

Head and body 190 mm.; tail 136; hind foot (s. u.) 32.

* Ann. & Mag. N. H. (7) xiv. p. 200 (1904).

Skull: tip of nasals to front angle of interparietal 36·5, greatest breadth 22; nasals 16 × 5·1; interorbital breadth 6; palate length from henselion 19·8; diastema 10·5; palatine foramina 7·6 × 3; length of upper molar series 7·2.

(This species is no doubt very closely allied to *M. prætor*, but differs by its peculiarly thick incisors and differently shaped palatine foramina.) Besides the typical specimen mentioned above, Mr. Monckton has sent an imperfect skull showing similar characters, while Mr. Stalker obtained in the Conflict Islands, off the S.E. corner of New Guinea, an example of what also appears to be the same species. *Mus prætor* is found in the Solomon Islands and New Britain.

√ *Uromys Moncktoni*, sp. n.

♂. 8. B.M. no. 4. 8. 3. 4. Collected 12th September, 1903. *Type.*

Two young specimens.

(Allied to *U. levipes*, Thos., but with shorter feet and more hairy tail.)

General colour above of the same dark brown (Prout's brown) anteriorly as in *U. levipes*, and similarly passing into russet on the rump. Under surface dull soiled pinkish buff, the slaty bases of the hairs showing through; lower part of flanks more distinctly buffy, the line of demarcation not sharply defined; no hairs on belly without slaty bases. Head rather greyer than back. Ears small, rounded, naked. Upper surface of head and feet dull creamy white; feet decidedly shorter than in *U. levipes*. Tail different from that of any other *Uromys* by being to a certain extent hairy, each scale having three or four hairs, as long as itself or rather longer, projecting from its hinder edge; in other species if any hairs are present they are rarely one third the length of a scale; in colour the tail is dull brown, scarcely lighter below.

Skull very much as in *U. levipes*, the palatal foramina and tooth-row each slightly shorter than in that species.

Dimensions of the type:—

Head and body (in skin) 100 mm.; tail 127; hind foot (s. u.) 30·5; ear 16.

Skull: greatest length 38·5; zygomatic breadth 18·2; nasals 12·8 × 4·4; interorbital breadth 6·1; palate length 16·5; diastema 10·1; palatal foramina 5 × 2·6; length of upper molar series 7.

This species is no doubt closely allied to *U. levipes*, but is distinguishable by its buffy instead of clear greyish belly, and

by the unusual number and length of the hairs on the tail. Even then, however, as in other species of *Uromys*, this organ appears to the naked eye to be practically hairless.

The corresponding species obtained by Mr. Stalker I have provisionally referred to *U. levipes*, but as the skins have been smoked, and the type was skinned out of spirit, this determination may hereafter need revision.

Uromys porculus, sp. n.

♂. Aola, Guadalcanar, Solomon Is. Coll. C. M. Woodford. B.M. no. 89. 4. 3. 8.

(A large species with a short tail.)

Size about equalling that of the large long-tailed *U. sapientis*, Thos., while the length of the tail is as in the much smaller *U. Bruijnii*, Pet., and its allies. Fur of medium length, the ordinary hairs of the back about 12 mm. long, but intermixed with them are a number of longer bristles attaining about 22 mm. General colour above "Prout's brown," becoming umber on the rump. Head bistre-brown. Ears very small, scarcely projecting above the fur, and not reaching to the eye when laid forward. Sides dark greyish brown, passing, without lines of demarcation, into the soiled cream-buff of the lower surface, where the slaty bases of the hairs dominate the general colour; a patch of clear cream-buff on the chest. Arms and legs brownish grey; hands and feet dull whitish; the feet very broad and heavy, with large rounded pads. Tail short, thin, naked except at the extreme base, covered with a fine mosaic of non-overlapping scales, which average about 13–14 to the centimetre; the extreme end comparatively smooth; colour of tail black above and below.

Skull of about the length of that of *U. sapientis*, therefore enormously larger than that of any of the short-tailed species. But it is narrower and has a longer and less broadened brain-case. Nasals broad anteriorly, abruptly narrowing mesially. Interorbital region flat, sharply edged, with small postorbital projections placed not on the ridges as is usual, but below them, somewhat as in *Hyomys Meeki* *. Parietal ridges not conspicuous. Anterior plate of zygoma-root projected forwards. Palatine foramina of the usual small size. Posterior edge of palate level with the middle of m^3. Bullæ quite small.

Dimensions of the type (measured on the spirit-specimen before skinning):—

Head and body 220 mm.; tail 130; hind foot (s. u.) 43; ear 19.

* Figured P. Z. S. 1903, ii. pl. xxiii.

Skull: greatest length 51·5; basilar length 43·1; greatest breadth 25·7; nasals 19·5 × 7; interorbital breadth 8·2; interparietal 8 × 12; palate length 24·4; diastema 14; palatal foramina 7·2; length of upper molar series 10·3.

Hab. and *Type.* As above.

This fine species appears to be a giant member of the *U. Bruijnii* group, and to have no relationship to the long-tailed forms which it approaches in size.

When *U. sapientis* was described more emphasis should have been laid on the unusual size of the bullæ, which far exceed those of either the large *U. macropus* and its allies or the small *U. Bruijnii*. In *U. porculus* they are of the usual minute size.

Pogonomys Forbesi, Thos.

♂. 14; ♀. 13; and two young.

These are the first specimens of this interesting species that we have received as skins, the previous ones having been prepared from spirit-examples.

Petaurus breviceps papuanus, Thos.

♀. 11, 18.

"Native name 'Kaioyo.'"—*C. A. W. M.*

Dactylopsila trivirgata, Gray.

♂. 1.

Pseudochirus canescens gyrator, subsp. n.

♂. 46. Lindum Creek, Gira River District. Coll. W. Stalker.

Size smaller than in the typical form from N.W. New Guinea. Colour very much as in the figure of "*Phalangista* (*Pseudochirus*) *Bernsteini*" given by Peters and Doria *, the general colour similarly greyish, the head, arms from elbows, hands, and feet buffy. Under surface buff, the hairs with scarcely a trace of slaty at their bases; an indistinct patch on the throat whiter. Frontal line black, sharply defined, extending from in front of the anterior corners of the eyes to between the ears, fading off on the nape and back into a vague darker dorsal area rather more than an inch in breadth. Back of ears and a patch below and behind their bases blackish brown. Tail broad proximally, evenly tapering, brownish grey like the body for two thirds its length, then

* Ann. Mus. Genov. xvi. pl. xii. (1880).

darkening to blackish brown; below the middle line is well-haired and bright orange on the basal half, becoming whitish and thinner-haired on the third fourth of its length, and quite naked for about 35 mm. at its tip. In the typical form the tail is more thinly haired terminally, and the naked part below measures 55 mm.

Skull as in true *canescens*, but smaller in all dimensions.

Measurements of the type, taken by Mr. Stalker in the flesh :—

Head and body 240 mm.; tail 175; hind foot (s. u.) 30; ear 11.

Skull: basal length 43·3; greatest breadth 28; nasals 16 × 6·2; palate length 24·5; length of palatal foramina 4; front of incisors to back of last molar 24·5; combined length of three anterior molariform teeth 8·2.

Type. Young adult male. Original no. 46. Killed 15th January, 1904.

The only Phalanger of this group hitherto known in British New Guinea was *Ps. Forbesi*, Thos., from which the present animal differs by all the characters given in the 'Catalogue of Marsupials' as distinguishing it from *Ps. canescens*. As compared with the latter, a native of the extreme north-west of New Guinea, Mr. Stalker's specimen is surprisingly similar, considering the difference in locality, but is decidedly smaller (skull 43 as against 50 mm. in basal length) and the naked portion of the tail is shorter.

Owing to the faded state of the type of *Ps. canescens* in the Paris Museum, which Mr. Gerrit Miller has been good enough to re-examine for me, it is difficult to be sure that *Ps. Bernsteini* is synonymous with *Ps. canescens*, as has been supposed, but on geographical grounds their identity is probable.

Dasyurus dæmonellus, sp. n.

Skull. Gira River (*W. Stalker*).

♂. Avera, Aroa River, S. Coast. 20th May, 1903. Coll. A. S. Meek. B.M. no. 3. 12. 1. 24. *Type*.

(Allied to *D. albopunctatus*, Schl., but larger.)

Size intermediate between that of the very small species *D. albopunctatus* and *hallucatus* and the common Australian species *D. Geoffroyi* and *viverrinus*. Fur short, close, and crisp, not woolly; hairs of back about 9 mm. in length. General colour of head, fore-back, sides, and outer aspect of limbs dark olivaceous tawny; hind-back darker, nearly black. White spots small, rarely exceeding 5 mm. in diameter, fairly numerous, evenly scattered over the upper

surface, not present in front of the eyes, on the limbs, rump, or tail. Under surface and inner aspect of limbs dull whitish, not sharply defined, the greyish bases of the hairs showing through; throat more yellow; scrotum brown. Ears of fair size, rounded, hairy, dark brown. Hands and feet dark brown, rather darker than the olivaceous arms and legs; hallux present; sole-pads transversely striated. Tail evenly well haired, blackish, a line along the middle of the lower surface paler brown.

Skull thickly built, of normal proportions, not so short-muzzled as is described in *D. albopunctatus*. Nasals anteriorly slightly opened out and separated in the middle line, their most anterior points lateral instead of mesial; posterior expansion present as usual. Supraorbital edges rounded, postorbital processes well developed. Palatal foramina short, ending opposite the anterior part of the canines. Bullæ high and conical. Teeth as usual, the upper premolars oval in section, without diastemata. Molars decidedly larger than in *D. albopunctatus*.

Dimensions of the type (measured in skin):—

Head and body 350 mm.; tail 285; hind foot (s. u.) 53; ear 30.

Skull: basal length 65·6; greatest breadth 42; nasals, length 25, breadth anteriorly 6·5, at middle 5·5, posteriorly 10·5; interorbital breadth 15·8; intertemporal breadth 9·6; palate length 36·5, breadth between outer corners of m^3 23; palatal foramen 4·2; combined length of three anterior molariform teeth 13·6; breadth of last molar 5·6.

This Dasyure, the representative in British New Guinea of the *D. albopunctatus* of N.W. New Guinea, is readily distinguishable from that animal by its much greater size, as may be seen by a comparison of the dimensions here given with those of *D. albopunctatus* published in the 'Catalogue of Marsupials.'

Perameles Cockerelli, Rams.

♂, ♀. 0, 6.

LIV.—*Notes and Observations on the Distribution of the Larvæ of Marine Animals* *. By J. Stanley Gardiner, M.A.

In considering the distribution of larvæ our object is to ascertain how far the pelagic or planktonic larvæ of marine animals

* This paper was read at a meeting of the 'Challenger' Society in June last, and is now published by request of several of its members.

are of importance in distributing species and genera from shore to shore, from one littoral zone to another. It may, perhaps, clear the ground if I suggest, in the first place, that we confine our attention to such animals as belong to the *benthos*, the sedentary, creeping, and burrowing fauna of the bottom. Here we can deal for the most part with well-defined groups, all of true benthos forms, any extensive wandering of the species or genera of which must be due to the distribution of their pelagic larvæ, direct migration of the adults of littoral forms across or beneath the deep-sea being quite exceptional.

It appears to me that it would be a profitable and perfectly legitimate question to consider what would be the fauna of a bank or the littoral zone of an island upheaved halfway between Land's End and Bermuda after 100 or 1000 years! We should want to know accurately a great number of factors to answer such a question. First, we make inquiry as to what currents would lave our bank and what would be the temperature of the water around it at each and every season of the year. In the case cited, the only current of importance would be the Gulf Stream, and it would be an easy matter to ascertain or calculate the temperatures. We then carefully examine the topography of the ocean-basin and the surrounding coasts to see from whence it could with such currents become populated. If our bank arises, as it would, from 2000 fathoms and there are no shoals of less than 1000 or, possibly, 500 fathoms, our task would be simplified, and we would at once commence an examination into the littoral fauna of the Bermuda reefs and slopes. If, however, we found, as is quite possible, ridges or isolated banks arising to a less depth from the surface—I should suppose the vertical distribution of the littoral fauna to continue down to about 250 fathoms, the approximate depth to which light in the tropics appears to penetrate the sea-water—our task would be complicated by an almost complete absence of knowledge of the vertical range of most of the benthos animals; and in view of its extraordinary range as found by the 'Siboga' Expedition it is a factor which could not be neglected by us.

The subject, however, of our main inquiry would be the extent to which the benthos animals of Bermuda produce definite pelagic larvæ and the distances to which these could be carried by the currents. In the course of centuries a few of the animals would doubtless be conveyed over to our bank by means of floating timber or pumice or the feet of birds, much beloved of writers on distribution; but after full consideration we would be inclined to reject these sources as of small account. Our research, in truth, resolves itself into a

simple question, before which all others are of little moment: How many days can the various larvæ of the benthos animals live in the plankton?

To this question we may seek an answer by two means. First, we might take the faunas of a series of coral or recent volcanic islands, and compare them with the faunas of the nearest land-masses, or, better, of such land-masses as are swept beforehand by the currents which reach their shores. We may thus compare the littoral fauna of Bermuda with that of the Tortugas or Bahamas, or even the West Indies in general. We shall get certain positive results of utility, but those really valuable for our purpose should be negative. Certain littoral animals, and even groups of animals, will not be found. We say that their larvæ have not been able to live long enough to reach Bermuda! But is the temperature suitable? Surely Bermuda is mainly corallaginous, while the West Indies are largely volcanic, and in any case the bottom deposits of the latter are rich in silica! The West Indies are continental and have, as compared with Bermuda, a far richer food-supply! In effect the environment of the two localities is absolutely different, and our inquiry at first sight seems futile.

Perhaps the case of Bermuda and the West Indies is an extreme instance, where the conditions are widely diverse, but yet in respect to any islands or groups of islands in the Pacific the same arguments could be put forward, and in no instance that I am at present aware of could be properly confuted as regards banks more than 100 miles apart. Let not this, however, nor any other method of inquiry be despised! It is capable of results of some considerable value. Has our shore or that of Norway, of France, or of Spain, any of the characteristic animals of the West-Indian littoral fauna? In this instance a thousand conditions perchance are different; but why does the Indo-Pacific fauna reach to the Sandwich group, the Marquesas, and the Paumotus, and yet fetch no part of the American shore? The method may, indeed, give us differential results as we travel eastward in the Pacific Ocean or compare the faunas of the Azores, the Canary or Cape Verd groups with those of the nearest West-Indian banks. Some West-Indian genera, families, and even groups, maybe, are absent from the Western-Atlantic banks; other families are present, but their genera are different; yet in others we may find the same genera but the species are different; and, lastly, in still others the species are identical.

The critics of our views on distribution will, perhaps, and

do, use the argument that identical species in the above and many other distant localities are cases of parallel or even convergent evolution if they cannot raise ridges to span the intervening gaps sufficient to permit of the migration over of the species, so as to allow intercrossing to take place. We ourselves—I have done so—use that argument; but we ought first to exhaust every possibility, in the absence of direct observations of such evolution, to avoid getting into such a strait. At most, by our faunas we get the possible range of distribution of the larvæ, but what we want in the first place to know is their regular and average range. If we find different species of the same genera or different varieties of the same species of animals on the Ceylon and Maldive slopes, we may infer that the larvæ of these genera and species seldom interchange, and we may deduce from the known currents of the region the length of time for which the larvæ can—or rather do—continue to live as such. Although I consider that for the due progress of any science we must have a certain amount of speculation, yet it seems to me that this method is rather fatuous in the absence of any direct evidence of the length of time to which any of the larvæ can live in the open ocean.

Our second method is the direct study of the length of life of larvæ as such. In considering it I divide the larvæ for convenience under three heads—the crustacean, the trochosphere and its derivatives and allies, and the planula and its allies. I deliberately omit certain larvæ, partly because they are unimportant, or I have not found any observations to aid me, or they have not come under my notice in the plankton with which I have had to deal. The most important of those thus omitted is the ascidian tadpole, in respect of which I have no direct observations, never having found it more than twenty-four hours (measuring the current in time) from land, though one is compelled to suppose from its structure, so efficient for pelagic life, that it can be carried for many days and considerable distances. In any case the distribution of the Tunicata is so little known that it is of no aid, but I have not heard of any occurrence that would give it a life of more than five or six days. I mention it, however, because it has saved me from one error, which I nearly committed rather extensively, but which suggests a method that may yet yield valuable results. Certain acinetid and vorticellid Protozoa commonly settle on tunicate and other larvæ. They branch dichotomously, and, according to some observations of my own at Naples in 1895, they divide and hence branch dichotomously each night, the observations

being continued to the seventh and eighth branchings, 128 and 256 heads, on the seventh and eighth successive nights. Here we have an apparently ready means of determining the age of the larvæ on which the Protozoa may be settled, but one which fails absolutely, since I have, on some specimens of the ascidian tadpole 20 hours old which Prof. Herdman has been kind enough to allow me to examine, found colonies of such animals with 8 and 16 heads, 3 and 4 branchings.

Crustacean larvæ may be soon disposed of. I have kept zoœas unchanged for 12 days. I have found them and also a few nauplii right to the west of Minikoi in the south-west monsoon, not conceivably less than 25 to 30 days old, unless there be shoals that we know not of or unless they belong to adults which live below 1000 fathoms—an unlikely supposition. I have caught them on the east of Male in the Maldives (lat. 4° 12′ N.), and fancy from the currents that they must have come rather from the Nicobars or the East Indies than from Ceylon. We secured some to the south of Funafuti, scarcely less than twenty days from the Phœnix and Samoan groups, and my observations show that they made nought of the journey of 250 to 300 miles from Fiji to Rotuma, at least twelve days. Here is positive evidence enough, and one is inclined to conclude that wherever any bank may appear in the Indo-Pacific or Atlantic Oceans it should be speedily provided with a fauna of such Crustacea as possess free-swimming larvæ of the zoœan and more developed types *.

The trochosphere is in its typical forms the larva of the Polychæta, the Echiuroidea, and the Mollusca, modified but yet quite distinct in the Echinoderms, *Phoronis*, and the Enteropneusta, and also, though still more changed, of the Nemerteans and the Sipunculoidea. In its Echinoderm and Enteropneustan forms it differs for different species almost as much as do the adults, and so, perhaps, any direct research on the subject may be expected to yield in these groups the most definite results. According to Mortensen, in his "Plankton-Expedition" report, these (Echinoderm) larvæ would appear to be seldom found in the high-sea plankton—that of the open ocean. The inference would be that their period of life is, under normal circumstances, only of a few days' duration. As in the Sargasso Sea were found bipinnaria, auricularia, and ophiopluteus larvæ at least 800 miles from the nearest bank, and as it is in the highest degree improbable

* I have not found it possible to distinguish between the nauplius larvæ of pelagic and littoral forms.

that they belong to adults living in the deep sea, Mortensen's conclusion would point to there being a bank in the Sargasso Sea or to the adults living in the floating weed. So certain, too, are the students of the Enteropneusta of the limited distribution of their larvæ that, if there is one species of that group in a locality, they unhesitatingly refer to it any *Tornaria* that may be found in the same locality, even a single specimen, and describe it as its larva.

At the present day the keeping and rearing for experimental purposes of Echinoderm larvæ is a regular business and one of which I had some experience in 1895–96. Now those larvæ which have been worked at do not feed for 3 to 4 days after they have definitely assumed the larval condition, and they finally metamorphose after 20 to 40 days *. Any deduction from these facts must be in absolute disagreement with Mortensen's results; but possibly in the sea the period of Echinoderm larvæ before metamorphosing is quicker. However, one must conclude that they may at times be drifted for 20, 40, or some even 60 days at the mercy of the currents. Nevertheless I only found in the localities cited above larvæ of Echinoderms off Rotuma, 4 plutei, 1 bipinnaria, and 1 brachiolaria, each from a different sample of plankton. I may parenthetically remark that my observations at Naples showed that the more food given to these and all larvæ the quicker they grow and metamorphose, other conditions being the same. All the Echinoderm larvæ float in the tanks near the surface of the water so long as they are healthy and the water be undisturbed, while the typical trochospheres sink down to varying depths, some of the largest and really healthiest ones almost lying on the bottom both by night and day. To summarize and to conclude, it would appear to me that no results in distribution can be expected, so far as the Indo-Pacific is concerned, from Echinoderms — and probably also from Enteropneusts—other than the Crinoids, the motile condition of the larvæ of which would seem to be scarcely longer than that of the planulæ to be mentioned later.

The typical trochospheres, both Molluscan and Annelid, are more difficult to keep in tanks than the Echinoderm larvæ.

* Mr. L. Doncaster has given me the following data:—

		Fertilized.	Metamorphosed.
34 days.	*Strongylocentrotus* ♂ × ♀	May 14.	June 17.
32 „	*Echinus* ♂ × ♀	June 23.	July 25.
38 „	*Echinus* ♀ × *Strongylocentrotus* ♂.	March 5.	April 12.
27 „	„ „	May 16.	June 11.
27 „	„ „	June 14.	July 11.

Generally my stock died off in 4 or 5 days, an occurrence ascribed at the time to wrong and insufficient food, &c. Unfortunately I could not carry the experiments very far; but the larvæ of one molluscan, given to me by Signor Lo Bianco, began to show decided changes to veligers after their third night as trochospheres, *i. e.* 70 to 80 hours; but this, I fancy, is altogether exceptional. At the previously cited localities I found no such larvæ (nor veligers), though they were numerous and increasingly common as one beat up for the last 150 miles from Rotuma to Fiji. I obtained, however, off Rotuma a number of specimens of what appeared to be a Sipunculid larva, and which must have come from Fiji or from deep-sea parentage.

I now come to the planula-group of larvæ, a group to which the young of most Cœlenterates belong, as well as certain sponges, Turbellaria, &c. My observations in the tropics were carried out mainly in connexion with the distribution of Cœlenterates, and particularly of corals. The difficulties on account of size and delicacy are much greater when one sets out to examine a group of larvæ such as these; yet I convinced myself that the nets &c. were suitable, and I found at Minikoi practically no difference in depth either by night or day. Actinian larvæ, according to my observations at the latter locality, at Rotuma, and at Funafuti, live for seven or eight days as such, but on the fifth day the planulæ of several species of corals had settled in the jars kept for the purpose. In none of the localities cited above from which I took plankton did I find any planulæ, nor, indeed, did I obtain any at a greater distance than 50 miles away from the nearest reef. In fact, my observations lead me to conclude that in no case could they be directly carried from Ceylon to the Maldives, though it is conceivable that these larvæ might be swept from reef to reef *viâ* the various Laccadive banks, and so reach that group.

I fear, however, that in the present state of our knowledge any consideration of larval distribution is premature and must be inconclusive. I start, perhaps, with a fallacy in assuming that the deep-sea fauna on our ocean routes does not send up larvæ to the surface-waters, though the general tendency of its forms appears to me to be to give up larval development or to reduce it as much as possible. I leave out of account the effect on the different forms of the various predatory animals of the plankton, well knowing that my limited observations may be invalidated by the larvæ having been preyed on by some particular form abundant at the time. I know that my observations are not sufficiently numerous to

be free from error, and, furthermore, I am quite aware that one should consider species and genera rather than groups. *But yet I venture with due respect to direct attention to the subject in the hope that zoologists who are dealing with plankton will not confine their attention merely to the adult groups of the same, but will, in addition, arrange for the examination of the larvæ therein in view of the distribution of the different groups of littoral animals.*

Considering each side of the question, remembering in particular the faunas of oceanic banks, so far as we know them, I venture to suggest that there are no banks to which an abundant variety of Crustacean larvæ cannot pass, that the maximum regular passage for Echinoderm (not Crinoid) and Enteropneust larvæ is about twenty days, while for Sipunculids, Annelids, Mollusca, and Crinoidea it is progressively less, the series passing on to Müller's larva, found in the Turbellaria, and ending with regular planulæ not as a rule exceeding more than four or five days of oceanic life, and probably in many forms averaging much less.

Take the Chagos Archipelago as a case in point. Crustacean larvæ should reach it freely from the Seychelles or Africa and Australia, and the Crustacean faunas of the three localities should be approximately the same for all forms of the group possessing larval development. Many of the Echinoderms and Enteropneusta should be common to the Seychelles and Western Australian, but the Chagos forms might reasonably be expected to show some small variations from their possibly parent stocks on either side. These differences should be progressively more important in Sipunculids, Chætopods, and Echiuroids, while the corals and Turbellaria should have no more resemblance to those of the Australian than to those of the African shore, and should for the most part, indeed, have begun to take on forms which are distinct varieties or subspecies of those found in the Seychelles.

Zoological Laboratory,
Cambridge.

LV.—*The Butterflies of the Group* Callidryades *and their Seasonal Phases.* By Arthur G. Butler, Ph.D., F.L.S., F.Z.S., &c.

Between the years 1897 and 1899 I revised a number of genera of Pieridine Butterflies in the pages of the 'Annals,' and indicated their seasonal phases; but I unaccountably

omitted to include the *Callidryades*. Perhaps, as the group contained no undescribed species, I hardly felt justified in occupying official time upon it whilst other groups urgently needed attention. Now that I have time to spare, I think it advisable to point out that many of the supposed species recorded in my 'Monograph of *Callidryas*,' published in 1873, as well as one or two described subsequently, are unquestionably only seasonal phases of other species.

I have been asked recently, as in the past I asked others,—"How do you know that these forms which you put together are only phases of one species?"

When we take up the study of any branch of natural science we find that Nature works by rule. It is now known definitely that among the Satyrinæ the wet phases are ornamented with well-defined ocellated spots, which in the dry phases are either greatly reduced in size (the pupils alone being left in some cases) or are wanting altogether.

In some butterflies the wet phases have the apex of the primaries produced into a long process, which is greatly reduced or wanting in the dry phases. In many the under surface of the wings in the wet phase has a defined pattern in brilliant colours, whereas in the dry phase this surface is blurred and so coloured as to resemble a decaying or withered leaf.

In the Pierinæ all silver spots tend to disappear from the under surface in the dry phase; as a rule, heavy borders or conspicuous markings disappear or become less prominent; in many species pink or sandy colouring is seen on the secondaries and the apical area of the primaries below. In a word, the butterfly is so coloured as to be least conspicuous amongst its dry surroundings.

Enough species have been bred by experienced field-entomologists to prove that these marked differences are authentic; therefore, when we compare two forms from the same locality which only differ precisely as the seasonal phases of one species ought to differ, and particularly when we find individuals of one of these forms which in some of their characters show gradation towards the others, we are fully justified in concluding that they are conspecific.

When a wet or a dry phase is not required for the preservation of a species, it tends to disappear, so that the insect eventually becomes monomorphic; but in some cases all the gradations between the extreme phases persist and the species becomes polymorphic, as in *Precis archesia*, which exhibits seven fairly defined gradations.

The typical *Callidryades* are now divided into six genera,

though some of these, being founded upon secondary sexual characters, would be regarded perhaps as subgenera. With the exception of *Rhabdodryas* (subsequently characterized) I indicated the structural distinctions in my 'Monograph of *Callidryas*.'

Callidryas, Boisd.

The following species are evidently seasonal phases:—

Wet phase.	Dry phase.
C. avellaneda, Herr.-Sch.	*C. solstitia*, Butl.

In *C. thalestris* and *C. philea* the seasonal phases are ill-defined; in *C. fornax* and *editha* we know only one phase.

C. sennæ, Linn.	*C. drya*, Fabr.

In my Monograph these two phases are figured side by side on pl. vi., so that the differences can be readily seen. The species ranges over South and Central America and the West Indies. Of the nearly related *C. eubule*, Linn., from North America, the seasonal phases differ very slightly, if at all, from each other.

By several entomologists *C. eubule* has been confounded with *C. sennæ*, but apart from its ill-defined summer and winter phases, it is longer in wing and invariably sulphur-yellow in both sexes. I should as soon think of uniting *C. thalestris* and *philea* as *C. sennæ* and *eubule*.

Parura, Butler.

Wet phase.	Intermediate phase.	Dry phase.
P. rurina, Feld.	*P. intermedia*, Butl.	*P. virgo*, Butl.

In this species the phases are remarkably distinct, but in the smaller *P. bracteolata*, Butl., *neocypris*, Hübn., and *irrigata*, Butl. (which are nearly related to each other), the dry phase seems to be characterized only by the much reduced markings on the under surface.

Rhabdodryas, Salv. & Godm.

In the sole species (*R. trite*, Linn.) the black outer border is obliterated in the dry phase, and the markings below are all ill-defined or reduced in width.

Phœbis, Hübn.

In *P. agarithe*, Boisd., the phases are not well-defined, but the dry phase has the under-surface markings reduced; there

seems also to be a tendency to reduction in size in both sexes as well as of the black and orange markings on the upper surface of the female.

Wet phase.	Dry phase.
P. cipris, Cram.	*P. argante*, Fabr.

In the dry phase the black border on the upper surface is much reduced, often only indicated by dots in the male; the silver spots disappear from the under surface of the male and the pearly-purplish and bluish patches from the same surface of the female.

In the insular *P. rorata*, Butl., there appears to be only one phase.

Aphrissa, Butl.

Of *A. neleis*, Boisd., *A. Wallacei*, Feld., *A. jada*, Butl., *A. orbis*, Poey, *A. hartonia*, Butl., and *A. Godartiana*, Swains., I know only one phase. *A. hartonia* and *Godartiana* are insular forms somewhat nearly related, and will doubtless be regarded as subspecies of one type by lepidopterists of the present day; they are, however, absolutely constant to locality, which is more than can be said of the myriad individual sports and aberrations now being raised to equal rank with insular forms by the advocates of trinomial nomenclature.

Wet phase.	Dry phase.
A. statira, Cram.	*A. fabia*, Fabr. = *Boisduvalii*, Feld.

There are two very pretty intermediate males from Panama in the British Museum collection.

A. jaresia, Butl., is evidently a highly coloured form of the female (wet phase): an integrade from this to the normal female is in the Museum collection.

Catopsilia, Hübn.

Wet phase.	Dry phase.
C. pomona, Fabr.	*C. crocale*, Cram.

C. phlegeus, Wall., and *C. heera*, Swinh., are intermediate wet phases; and *C. jugurtha*, Cram., *jugurthina*, Godt., and *endeer*, Boisd., intermediate dry phases. It is possible that the numerous intergrades between the extreme phases of this butterfly are due to the fact that evolution has, in this case, not limited the phases to their proper seasons; so that typical *C. pomona* and *crocale* may be taken *in copulâ*.

C. flava, Butl., is a dry phase from the Celebes; the wet phase resembles *C. pomona*, excepting that the discal markings

on the upper surface of the female are continued across the primaries.

Wet phase.	Dry phase.
C. thaurama, Reak.	*C. Grandidieri*, Mab.

These differ much as *C. pomona* does from *C. crocale*.

C. florella, Fabr.	*C. pyrene*, Swains.

C. aleurona, Butl., is a wet intermediate phase, and *C. hyblæa*, Boisd., dry intermediate: all four occur together and interbreed at Aden.

C. pyranthe, Linn.	*C. thisorella*, Boisd.

Oddly enough, *C. chryseis*, Drury, which is seen by the under-surface characters to be a dry type, is distinctly larger than *C. pyranthe* and quite as heavily bordered on the upper surface; the size probably has a local significance (many Chinese forms being large). Other intergrades between the extreme wet and dry phases are *C. alcyone*, Cram., *C. minna*, Herbst, and *C. ilea*, Fabr.

C. evangelina, Butl., is a representative of *C. pyranthe*, occurring in Flores, Bali Island, and Sumatra; it is a very round-winged species with a wet character of upper surface but a distinctly dry under surface.

C. nephte, Fabr., is a wet phase with a very dry aspect of upper surface; the dryest phase of it which I know is *C. gnoma*, Fabr., but it is not very marked. It seems related to *C. lactea* from Australia, of which I know only a dry phase.

C. gorgophone, Boisd.	*C. hinda*, Butl.

I have recognized only females of the dry phase, from which I should judge that the males have a much closer resemblance to those of typical *C. gorgophone*.

C. scylla, Fabr.	*C. etesia*, Hewits.

I think this last doubtful; it is quite possible that it is merely a variation with no seasonal significance.

LVI.—*Description of a new Lizard from Western Australia.*

By G. A. Boulenger, F.R.S.

[Plate XI.]

Amphibolurus Websteri. (Pl. XI.)

Habit slender. Head moderately large, once and a half as long as broad; snout as long as the diameter of the orbit,

with obtuse canthus rostralis; nostril nearer the eye than the end of the snout, situated below the canthus rostralis; tympanum large, its vertical diameter two thirds the horizontal diameter of the orbit; upper head-scales subequal, strongly keeled, smallest on supraocular region; a series of large, keeled, tubercular scales from the orbit to above the tympanum. Skin of neck strongly plicate, the folds bearing short erect spines. Gular scales much smaller than ventrals, obtusely keeled. Body feebly depressed, covered with small, uniform, sharply keeled scales, smallest on the sides; on the back the keels directed obliquely towards the vertebral line, which bears a low crest; a well-developed nuchal crest; a fold along each side of the back; ventral scales sharply keeled. Limbs and digits very long, the hind limb reaching the tip of the snout; foot as long as the fore limb. An uninterrupted series of 44 femoral and præanal pores, extending along nearly the whole length of the thighs and forming an angle on the præanal region. Tail slender, slightly compressed, twice the length of head and body; caudal scales small, equal, strongly keeled. Reddish brown; the adult with dark vermiculations and fine longitudinal lines on the sides, a very dark streak on each side of the back, and black bars across the neck and anterior part of body.

	mm.
Total length	350
Head	25
Width of head	17
Body	90
Fore limb	41
Hind limb	90
Tail	235

Two specimens, a male and a young, formed part of a collection of reptiles made by Mr. L. Clarke Webster in the Coolgardie District, in the interior of West Australia (400 miles inland of Perth). Mr. Webster's collection contains besides examples of some little-known species:—*Diplodactylus ciliaris*, *Tiliqua occipitalis*, *Egernia striolata* (var.), *Egernia depressa*, *Lygosoma præpeditum*, and a second example of the death-adder described by me a few years ago as *Acanthophis pyrrhus*. This example agrees very closely with the type, from Station Point, South Central Australia, and has 141 ventral shields and 53 caudals, of which the last 26 are in pairs.

LVII.—*Descriptions of Two new Cyprinid Fishes from Yunnan Fu.* By C. Tate Regan, B.A.

In a recent paper (Ann. & Mag. Nat. Hist. (7) xiii. 1904, pp. 190–194) I described some fishes from the lake at Yunnan Fu, collected by Mr. John Graham. The British Museum has now received from him a second consignment from the same locality, including examples of two species which are described below as new to science.

Barilius Andersoni.

Depth of body $4\frac{2}{5}$–$4\frac{4}{5}$ in the length, length of head 4. Snout as long or nearly as long as the eye, the diameter of which is 4–$4\frac{1}{4}$ in the length of head and equal to or a little less than the interorbital width. Mouth small, oblique, the maxillary not extending to below the eye; no barbels. Scales 97–105 $\frac{18-20}{8-9}$, 3 or 4 between lateral line and root of ventral. Dorsal III 7, its origin a little behind that of the ventral and equidistant from tip of snout and base of caudal. Anal III 10. Pectoral extending $\frac{2}{3}$ of the distance from its base to origin of ventral. Caudal forked. Caudal peduncle twice as long as deep. Purplish above, silvery on the sides and below.

Two specimens, 95 and 125 mm. in total length.

This species resembles *B. polylepis*, Regan, from the same locality, but is distinguished by the smaller eye, more numerous scales, and shorter anal fin. I have named it in memory of the late Dr. John Anderson, to whom we are principally indebted for our knowledge of the Reptiles and Fishes of Yunnan.

Oreinus Grahami.

Depth of body $4\frac{1}{3}$–5 in the length, length of head 4–$4\frac{1}{4}$. Diameter of eye $4\frac{1}{5}$–$4\frac{3}{5}$ in the length of head, length of snout $3\frac{1}{3}$–$3\frac{1}{2}$, interorbital width 3–$3\frac{1}{2}$. Margin of lower lip concave; barbels subequal, or the posterior the longer and $\frac{1}{4}$ the length of head. About 98 scales in the lateral line, 23 between origin of dorsal and lateral line, 17 between lateral line and root of ventral. Dorsal IV 8, its origin equidistant from tip of snout and base of caudal; the compound serrated ray rather slender and distinctly articulated, its length equal to or a little greater than the distance from anterior margin of eye to extremity of operculum; upper margin of the fin concave. Anal III 5, extending nearly to

the base of caudal when laid back. Pectoral extending $\frac{1}{2}$–$\frac{3}{3}$ he distance from its base to origin of ventral. Caudal forked. Caudal peduncle $1\frac{2}{3}$–2 as long as deep. Purplish above, silvery below.

Three specimens, 118–170 mm. in total length.

This species is especially distinguished by the rather long barbels and the slender serrated dorsal ray.

LVIII.—*On some new Butterflies and Moths from the East.*

By Colonel C. Swinhoe, M.A., F.L.S., &c.

Family **Euplœidæ**.

1. *Betanga moluccana*, nov.

♂. Palpi, frons, and head deep black; palpi with a disconnected white stripe on each side and another behind the eyes; top of head with two white dots on each side: body and fore wings dark brownish black: hind wings paler and paling much towards outer margin, the lower portions being much browner; both wings and body without any markings; the costal portion of the hind wings pale and shining, but not whitish, as is usual in the species of this genus. Underside uniform blackish brown, the lower portion of fore wings whitish; spots white, tinged with blue, one at end of cell of fore wings, another above it near the costa, a row of four spots parallel with these, four submarginal dots rather far from the margin; an elongated, rather large, pure white spot in the middle of the wing between veins 2 and 3: hind wings with a spot at the end of cell, a curved series of six spots round it, one close to the costa a little to the outside of the curved series, and a submarginal row of spots, the hinder ones reduced to mere dots on one wing and some of them obsolete on the other; some white spots on the legs.

Expanse of wings $3\frac{2}{10}$ inches.

Obi, Moluccas.

Nearest to *Duponchelii*, Boisd., the sexual brand on the upperside of the fore wings very much shorter and broader, its upper side curved and its outer end acute; on the underside the central white spot on the fore wing is a great deal shorter and more rounded. I have had this form in my collection for a long time, and though it has been to Tring and to the British Museum, and I have searched all the literature I can find on the genus, I have not been able to find that it has ever been described.

Family **Nymphalidæ.**

2. *Acca obiana*, nov.

♂. Black; palpi white, with black tips; a very broad median white band across both wings, from the middle of the abdominal border of the hind wings, where it is narrowest and rounded, to vein 4 on the fore wings, divided by the veins, which are more or less blue, and with a narrow irregular band of blue scales all round it; the inner margin of the band is nearly straight, the outer margin outwardly curved on the hind wings only; on the fore wings the veins divide the band into three parts, the middle one the largest; two white subapical spots above the band; a row of submarginal spots on both wings; all the spots ringed with blue, the lowest (duplicate) submarginal spot on the fore wing and all those on the hind wing entirely blue. Underside as above, but without the blue, the submarginal spots larger and pure white, and in addition there is a broad, somewhat wedge-shaped, and curved white basal streak on each wing, and three cell-spots and two beyond on the fore wings: body below white; legs white, with black streaks.

Expanse of wings $2\frac{3}{10}$ inches.

Obi, Moluccas.

A *Neptis* belonging to the *venilia* group, but is a good form, distinguishable by its broad white rounded band and narrow blue border.

Family **Hesperiidæ.**

3. *Tagiades bubasa*, nov.

♂. Palpi blackish brown above, white beneath; head, body, and wings blackish brown; spots white, one at upper end of the cell and another at the lower end; a spot outside the lower end and another immediately below it; five subapical dots, as in *sivoa*; cilia brown: hind wings with the hinder third pure white, with very faint indications of grey on the margin; the hinder half of cilia white, the upper half brown; two indistinct black spots in the disk, the lower one touching the white band. Underside: fore wings as above; four or five extra spots, almost square, running up in the form of a straight band from near the hinder angle; hind wings white, with a broad brown costal band, containing on its inner margin a black spot and another below it (in one example this last spot is absent), and also a black lunular mark on the

outer margin one third from the anal angle: body and legs white.

Expanse of wings $1\frac{8}{10}$ inch.

Humboldt Bay, New Guinea. 2 ♂.

The white of the hind wings is much as in *dealbata*, Distant, which I have from Borneo, but it is much larger and very different in the markings above and below.

4. *Tagiades hovia*, nov.

♂. Palpi blackish brown, white beneath; head, body, and wings blackish brown; spots white: fore wings with two spots at the end of the cell and two beyond it, the two outer the largest; a whorl of five subapical dots, as usual: hind wings with a white anal band, narrowing a little upwards and extending for nearly half the length of the outer margin; four black spots on the outer margin of the wing in the upper half of the white band, and two larger black indistinct spots above its upper end; abdominal marginal space whitish. Underside: fore wings dark brown, the hinder margin whitish; spots and dots as above, the subapical whorl of dots continued down the wing to near the hinder margin as a macular submarginal band, gradually becoming larger hindwards: hind wings white, with a broad costal brown band, its inner margin containing three large black spots, two joined together touching the band near the outer margin, and a marginal, more or less disconnected, thin, black band extending downwards to vein 1: body and legs white.

Expanse of wings $2\frac{1}{10}$ inches.

Shortland Islands. 2 ♂.

Allied to *japetus*, Cram., which I have from Amboina, but the white band of the hind wings is very much broader and differently marked.

5. *Tagiades sivoa*, nov.

♂. Palpi blackish brown, white beneath; head, body, and fore wings blackish brown; spots small and elongate, one at end of cell, two above it, and one below cell in an inwardly oblique line, one immediately above the last outwardly oblique, two below costa near apex, two outside the lower one and almost in a line with it towards the outer margin, and another below the outer one; an almost obsolete whitish patch near hinder angle; cilia black: hind wings blackish brown, with a broad white band from the centre of the outer margin to the abdominal margin, where it widens, extends shortly upwards,

and broadly on to the anal angle, joining the pure white cilia, which extends for two thirds upwards, the remaining third being black. Underside as above, but the whitish patch near hinder angle of the fore wings is larger and nearly pure white, and indistinctly runs up the wing a short distance divided by the veins; on the hind wings the white space is larger, making, in fact, the wings white, with a broad blackish-brown costal and marginal continuous band, with its inner edge irregular and somewhat macular; in some examples the outer marginal portion of the band is altogether macular: body and legs white; anal fourth of abdomen above white.

Expanse of wings $1\frac{8}{10}$–2 inches.

Humboldt Bay, New Guinea. 3 ♂.

Allied to *T. presbyter*, Butler, which I have from New Britain and Humboldt Bay, and to *trebellius*, Hopffer, which I have from Celebes; but the form of the white patch is very distinctive.

Family **Lithosiidæ**.

6. *Lyclene peloa*, nov.

♂ ♀. Palpi, head, body, and fore wings ochreous yellow: fore wings with a black line on the costa for one third from base, an antemedial outwardly curved black line with some black marks inside it; a discal, acutely dentated, black line from costa near apex to middle of hinder margin; two black dots below the costa just inside it and some black submarginal spots: hind wings much paler, without any markings. Underside with the costal third of fore wings broadly black, some black suffusion inside the wing; abdomen below with the apical third black in the male; fore legs striped with black.

Expanse of wings, ♂ $\frac{8}{10}$, ♀ 1 inch.

Padang, Sumatra. 1 ♂, 2 ♀.

Family **Deilemeridæ**.

7. *Deilemera eddela*, nov.

♂. First joint of palpi yellow, second and third black: frons, head, and body yellow; a black spot on frons, one on the head, one on each side of collar; thorax with a spot on each shoulder, a pair in front, and three on each side; abdomen with black segmental bands above and a row of black spots on each side: fore wings pale chocolate-brown, veins, bands, and spots white; a short basal square band; a broad short band with

irregular sides from the lower end of cell to the costa above; a subapical spot, another of same size near middle of outer margin; a streak on the outer half of vein 2, the hinder margin thinly white: hind wings white, with a broad, submarginal, pale chocolate-brown band, which is connected with the outer margin above the middle by a short similar band and does not reach the abdominal margin, but is somewhat attenuated hindwards and stops short at vein 1. Underside: body and legs yellow; wings as above, except that on the hind wings there is a long brown spot touching the upper part of the cell near the middle and some yellowish suffusion towards the anal angle.

Expanse of wings 2 inches.

Engano.

Belongs to the *evergista* group.

Family **Lymantriidæ**.

8. *Euproctis revera*, nov.

♂ ♀. Antennæ, frons, and head ochreous; thorax dark brown; abdomen black; a band of ochreous at the base of the anal tuft in the female; male with the basal half of both wings pale black, the outer half ochreous; the female with both wings of a uniform pale dull black, except the apical third of the costa of fore wings and the outer borders of both wings, which are evenly ochreous. Underside as above; no markings above or below.

Expanse of wings, ♂ $1\frac{2}{10}$, ♀ $1\frac{3}{10}$ inch.

Granville, New Guinea.

Allied to *E. lodra*, Moore, from Java, and of the same shape in the female, but in that species the fore wings are uniformly pale black, without any yellow marginal border, and the outer half of the hind wings is ochreous. The type of *lodra* (a female) is unique in the B. M.; I have two from the same locality in my own collection; all three are identical: the male is unknown.

9. *Leucoma semihyalina*, nov.

♂. Pure white, very sparsely clothed; wings shining and as hyaline as in *L. silhetica*, Walker; costa of fore wings with a slight ochreous tinge; a black spot on the middle of the discoidal veinlet; otherwise both wings and body above and below are absolutely without markings; antennæ slightly ochreous.

Expanse of wings $1\frac{2}{10}$ inch.

Padang, Sumatra.

The origins of veins 4 and 5 of the fore wings are more separated than is usual in the genus, and veins 6 and 7 of the hind wings are on rather a long stalk; it otherwise somewhat resembles *L. silhetica*, but is smaller, has the apex of fore wings blunter, and has a black cell-spot, which the other species has not.

Family **Thyrididæ**.

10. *Hypolamprus tessellata*, nov.

♂ ♀. Wings elongated; fore wings narrow, apex acute, semifalcate, outer margin excised from apex to vein 4, from whence it is straight and very oblique, the hinder margin being only two thirds the length of the costa; hind wings with the apex very acute and produced to a point, outer margin nearly straight.

Colour greyish white; a brown spot on the top of the head; thorax suffused with brown, abdomen with pale brown segmental lines: fore wings with the upper half suffused with pale brown; a black spot at the lower end of cell, joined by a line to a smaller spot at the upper end, the upper half striated closely with brown marks, the lower half and the whole of the hind wings tessellated with continuous striations running parallel to each other from the abdominal margin of the hind wings to the costa, continued on the fore wings from the outer portion of the hinder margin to the lower half of the outer margin, and running through these tessellations are two parallel white lines, medial and discal on the hind wings, submarginal and marginal on the fore wings; a black spot at the end of the cell of hind wings.

Expanse of wings, ♂ $1\frac{2}{10}$, ♀ $1\frac{6}{10}$ inch.

Padang, Sumatra.

Family **Quadrifidæ**.

11. *Spirama sumbana*, nov.

♂. Much like the common *S. retorta*, Linn., but the discal line across the fore wings which limits the dark part of the wing and curves round the ocellus in *retorta* is much nearer the middle of the wing and cuts through the outer ring of the ocellus, and the scarlet crimson on the abdomen is much more limited.

♀. Very different from the female of *retorta*; the general colour is purplish tinged, instead of ochreous; the outer black ring of the ocellus touches the white ring; the discal white

band of the fore wings and its corresponding medial band of the hind wings, together with the discal white band of those wings, are all nearly straight, whereas in *retorta* the two former are crenulated.

Expanse of wings $2\frac{2}{10}$ inches.

Waingapo, Sumba Island (*Doherty*).

12. *Spirama kalaoensis*, nov.

♂. More or less like a male *retorta*, but the transverse lines are obsolete, the black ring of the ocellus is distorted and not evenly curved, and there is no trace of white in it. It is perhaps nearest to *S. funesta*, Butler, but that form is easily distinguishable by its scarlet-crimson palpi and the distinct row of submarginal black spots on the fore wings.

♀. More or less of the pattern of *retorta*, but is a very peculiarly variegated form: the type specimen looks bleached in parts, but this is not the case; my two examples from the mainland of Flores are identically the same: the black ring of the ocellus is also much crenulated, and this does not seem to be the case in any other form of this genus.

Expanse of wings $2\frac{4}{10}$ inches.

♂ ♀, Kalao Island (types).

2 ♀, Flores.

13. *Baniana pannicula*, nov.

♂. Palpi ochreous, brown at the sides; frons, head, and collar ochreous; thorax and abdomen dark grey; a black stripe behind the collar and one on each side of the thorax: fore wings ochreous, minutely irrorated with grey; a prominent black spot at the end of the cell; a large black square patch in the disk, edged with white on its upper side, outwardly diffused into the broad blackish brown which occupies the outer third of the wing, this brown palest near outer margin and contains five pale dots in a submarginal row on its upper half; another large black patch, nearly triangular, with its lower part touching the hinder margin before the middle and ending in a tuft of scales: hind wings pale blackish brown, palest towards base.

Expanse of wings $1\frac{1}{10}$ inch.

Labuan, British N. Borneo.

Belongs to Hampson's section II. A; differs from *intorta*, Swinh., which I have from Bombay, Karwar, and Burma, chiefly in the prominent black cell-spot and the pale submarginal dots of the fore wings, very like *unipuncta*, Hmpsn., from Natal, but that also has no dots.

14. *Ercheia abnormis*, nov.

♂. Palpi, head, and thorax dark chocolate-brown; thorax with a duplicate grey band down the middle; abdomen dark grey, with indistinct darker grey segmental bands: fore wings pale greyish chocolate-colour; orbicular a small black dot inside a pale spot; reniform large, nearly oval, with an indistinct mark in it; antemedial, medial, and discal lines indistinct and incomplete, the last the clearest and lunular; two dark shades below the costa, medial and discal; a broad blackish band on the hinder margin, with its inner edge curved and running halfway up the outer margin; a thin white line on the edge and a short white streak beyond the middle of the line: hind wings pale blackish on the basal half, dark on the outer half; whitish on the costal space; a medial white spot and a white spot near the middle of the outer margin; cilia black, with two white patches, one near anal angle and the other beyond the middle. Underside greyish ochreous; a brown spot at end of cell of hind wings; a thin brown band across both wings beyond the middle, sinuous on the hind wings; a broad brown discal band and some brown suffusion and irrorations between this and the outer margins.

Expanse of wings 2 inches.

Goping, Perak (*Kunstler*).

There is an example of this form from Selangore in the B. M. without name in Quadrifid drawer no. 103.

The fore wings are longer and narrower than is usual in this genus.

15. *Phyllodes enganensis*, nov.

♂ ♀. Allied to *Verhuellii*, Voll., from Java, and *floralis*, Butler, from Borneo; differs from both in the form of the white patch on the hind wing, which is small and narrow, like a long square, its upper and lower margins more or less bluntly dentated, the crimson-red anal border extending from the upper level of the white patch nearly halfway to the middle of its lower side; the red not running into the white patch as it does in the other two forms, but quite distinct from each other; the fore wings of the male, as is usual in this group, are much paler than in the female, with the transverse fasciæ more distinct.

Expanse of wings $6\frac{1}{10}$ inches.

Engano, 1 ♂, 6 ♀.

LIX.—*Rhynchotal Notes.*—XXVIII. By W. L. Distant.

Subfam. *Cicadinæ* (continued from p. 336).

Division Cicadaria (*ante*, p. 329).

Since publishing my remarks on this division, a considerable quantity of fresh material has reached my hands, and to make the *Cicadaria* intelligible the generic analysis must be continued.

Stål (Œfv. Vet.-Ak. Förh. 1870, p. 714) proposed some subgenera, but on characters which, I venture to think, are insufficient and of a transient character. Thus his "nodo apicali scutelli," which I take to be the cruciform elevation at the base of the mesonotum, is described as typical of *Chremistica* in being "transverso, convexo." But this, though characteristic of the species he refers to, is not constant in the larger generic purview to which I am inclined, and the same remarks apply to the characters on which his subgenus *Dicroprocta* is founded. Had Stål subsequently revised the whole family with the skilled acumen displayed in his 'Enumeratio Hemipterorum,' there is a great probability that he would have shared these views.

Synopsis of Genera.

I. Metasternum not or very slightly elevated, and not provided with a posterior process.
 A. Length of head more than half the breadth of space between eyes; face usually very prominent.
 a. Head including eyes considerably broader than base of mesonotum.
 b. Lateral margins of pronotum with a distinct anterior lobe *Macrotristria.*
 bb. Lateral margins of pronotum without an anterior lobe *Rihana.*
 B. Length of head about half the breadth of space between eyes, or sometimes very slightly longer; head moderately truncate in front of eyes, face not prominent.
 aa. Head, including eyes, about as wide, or very little wider than base of mesonotum.
 c. Eyes more or less oblique and porrect, longer than broad *Cicada.*
 cc. Eyes circular, as long as broad, moderately exserted upwardly *Antankaria.*
 aaa. Head, including eyes, little more than two thirds the breadth of base of mesonotum .. *Cacama.*
 C. Length of head not half the breadth of space between eyes.
 aaaa. Head, including eyes, very much broader than base of mesonotum; space between eyes

almost equalling breadth at base of mesonotum; in front of eyes obliquely inclined, but not truncate *Oria.*

II. Metasternum elevated at middle and furnished with a posterior process directed backward *Cryptotympana.*

Rihana, gen. nov.

Cicada, subgen. *Chremistica*, Stål (part.), Œfv. Vet.-Ak. Förh. 1870, p. 714, note.
Cicada, subgen. *Cicada*, Stål (part.), *loc. cit.*
Cicada, subgen. *Diceroprocta*, Stål (part.), *loc. cit.*

Head distinctly longer than half the breadth between eyes, and including eyes wider than base of mesonotum; face more or less prominent, its lateral margins in line with lateral margins of vertex; eyes oblique, longer than broad; pronotum a little narrowed behind eyes, about or almost as long as mesonotum in front of cruciform elevation; abdomen not, or scarcely, longer than length between apex of face and base of cruciform elevation; other characters generally as in *Cicada*.

Type, *R. ochracea*, Walk. (*Fidicina*).

This genus includes a number of Oriental and American species.

Rihana virgulata, sp. n.

Head black; a spot at apex of face, an irregularly shaped spot behind lateral margins of face, and a spot between ocelli and eyes, all of which are ochraceous; pronotum brownish ochraceous, anterior margin narrowly pale ochraceous, posterior and lateral margins greenish; a central discal fascia widened anteriorly and posteriorly, on each side of which is a short, discal, longitudinal line, and the incisures, black; mesonotum black, two linear, obconical, discal lines on anterior area, lateral margins, the cruciform elevation, and a round spot (containing a black centre) in front of each of its anterior angles ochraceous; abdomen piceous; face beneath with the transverse ridges obscure castaneous; sternum mostly ochraceous; opercula pale dull ochraceous, their inner areas black; tegmina and wings hyaline; tegmina with the costal membrane greenish ochraceous, the costal area fuscous, venation mostly fuscous, the basal and longitudinal veins to the apical areas somewhat broadly margined with fuscous; claval area to tegmina and abdominal area to wings pale brownish ochraceous.

Length of head more than half the breadth of space between eyes, its breadth including eyes broader than base of mesonotum; tympanal coverings about as long as broad; rostrum

reaching the posterior coxæ, its apex piceous ; opercula well separated at their inner angles, their inner and outer margins oblique, their posterior margins subtruncate and not quite reaching base of abdomen.

Long., excl. tegm., ♂ 16 mm. ; exp. tegm. 59 mm.

Hab. Mexico (Brit. Mus.).

This species is readily recognized by the marginal shadings to the apical areas of the tegmina &c.

Rihana Swalei, sp. n.

Head dark castaneous ; apical spot to face and a spot behind its lateral margins, lateral margins of vertex, and a spot between ocelli and eyes, all of them ochraceous ; pronotum castaneous, anterior margin (narrowly) and lateral and posterior margins ochraceous, a central discal fascia broadened anteriorly and posteriorly (containing a central ochraceous line), on each side of which is a short, discal, longitudinal line, and the incisures dark castaneous ; mesonotum pale castaneous, with two central obconical spots, on each side of which is a much longer subangulated spot, black, narrowly margined with pale ochraceous; cruciform elevation and the tympanal coverings pale ochraceous;



Rihana Swalei, Dist. ♂.

abdomen castaneous ; body beneath and legs pale ochraceous, a castaneous spot near intermediate and posterior coxæ ; face beneath pale castaneous, space between face and eyes black, containing a transverse ochraceous line ; tegmina and wings hyaline, both ochraceous at base ; tegmina with the costal membrane and about basal half of venation stramineous or pale greenish, costal area and remaining venation fuscous, transverse veins at bases of first to fifth and the seventh apical area and the lower longitudinal margin to seventh somewhat broadly infuscate ; apical area of basal cell fuscous.

Length of head more than half the breadth between eyes, and (including eyes) broader than base of mesonotum ; tym-

panal coverings about as long as broad; rostrum reaching the posterior coxæ, its apex piceous; opercula with their outer margins nearly straight, their posterior margins strongly oblique and rounded apically, reaching the third abdominal segment, their inner angles not meeting.

Long., excl. tegm., ♂ ♀ 19–20 mm.; exp. tegm. 61–69 mm.

Hab. ——? (Types, ♂ ♀, Brit. Mus.)

Two specimens, male and female, presented by Dr. Swale to the British Museum, but without locality, constitute the material on which this species is founded. The figure given will, however, prevent confusion. It probably belongs to Central America.

Genus Cicada (*ante*, p. 330).

Cicada, Linn. Syst. Nat. i. p. 704 (1766).
Cicada, subgen. *Chremistica*, Stål (part.), Œfv. Vet.-Ak. Förh. 1870, p. 714, note.
Cicada, subgen. *Cicada*, Stål (part.), *loc. cit.*
Cicada, subgen. *Diceroprocta*, Stål (part.), *loc. cit.*

Type, *C. plebeja*, Scop.

Cicada graminea, sp. n.

♀. Head and thorax above grassy green; pronotum inclining to ochraceous, probably through discoloration; head with the basal lateral areas of face, a transverse fascia between anterior margins of eyes, basal margin, and the area of the ocelli purplish brown; mesonotum with two central lines (united anteriorly and posteriorly) and the incisures purplish brown; mesonotum with two anterior, central, short, obconical spots, on each side of which is a much longer and more elongate spot, a central, discal, lanceolate spot, and a spot in front of each anterior angle of the cruciform elevation purplish brown, outwardly margined with greenish ochraceous; abdomen above somewhat thickly greyishly tomentose; body beneath and legs more ochraceous than above, abdomen with some central discal transverse and some sublateral much smaller purplish-brown spots; tegmina and wings hyaline, the costal membrane and venation of basal area of tegmina greenish, remaining venation fuscous; venation of wings greenish.

Head truncate in front, its length half the breadth between eyes and (including eyes) as wide as base of mesonotum; anterior femora armed beneath with two strong spines; posterior tibiæ with three spines placed on each side on apical halves; rostrum not quite reaching posterior coxæ.

Long, excl. tegm., 26 mm.; exp. tegm. 85 mm.

Hab. Queensland (*F. P. Dodd*, Brit. Mus.).

ANTANKARIA, gen. nov.

Length of head about half the breadth between eyes and (including eyes) as wide as base of mesonotum ; eyes circular, globular, moderately directed upward ; pronotum a little narrowed behind eyes, about as long as mesonotum in front of the cruciform elevation ; abdomen longer than space between apex of face and base of cruciform elevation ; rostrum reaching posterior coxæ ; anterior femora strongly toothed beneath ; opercula in type not passing the base of metasternum ; tegmina and wings talc-like.

Type, *A. madagascariensis*, Dist. (*Cicada*).

CACAMA, gen. nov.

Head (including eyes) little more than two thirds the breadth of base of mesonotum, anteriorly depressed, its length only a little more than half the breadth between eyes ; pronotum considerably shorter than mesonotum, its lateral margins obliquely sinuate ; mesonotum somewhat convexly gibbous ; abdomen short, broad, convex above, its length equal to the space between apex of head and base of cruciform elevation, the lateral margins a little angulate at posterior segmental angles ; tympana completely covered, lateral margins of the tympanal coverings subparallel to the abdominal margins ; rostrum reaching or passing the posterior coxæ ; metasternum very large ; opercula about half the length of abdomen above, broad, their apical margins convexly rounded, their lateral margins almost straight ; tegmina and wings (excepting base) hyaline, the first broad, their greatest width a little less than half their length, apical areas eight in number, the two lowermost small, subquadrangular.

Type, *C. maura*, Dist. (*Proarna*).

ORIA, gen. nov.

Head (including eyes) very much wider than base of mesonotum, its length not quite half the breadth between eyes, lateral margins almost obliquely straight, very slightly sinuate ; pronotum shorter than mesonotum, its lateral margins moderately rounded, its posterior margin waved or broadly sinuate ; abdomen narrowed posteriorly in both sexes ; the tympana covered, tympanal coverings in male about as long as broad ; rostrum extending about halfway between the intermediate and posterior coxæ and terminating in the grooved anterior area of the metasternal process ; opercula

small, scarcely extending beyond the basal segment of the abdomen; tegmina and wings hyaline, a little opaque at base.

Type, *O. boliviana*, Dist. (*Cicada*).

Cryptotympana varicolor, sp. n.

♀. Body brownish ochraceous; pronotum with two inwardly curved obconical black spots and two more obsolete black oblique spots on each lateral area between the incisures, but not extending to the posterior margin; mesonotum with a large pale greenish discal spot, its base truncate and resting on the cruciform elevation, anteriorly divided into three angular prolongations which about reach the anterior margin; lateral areas of the sternum somewhat pale greenish. Tegmina and wings hyaline, bases of both brownish ochraceous; the tegmina with the costal membrane and area, the basal cell, the greater part of the venation, and the margins of the transverse veins at bases of second and third apical areas brownish ochraceous.

Length of head about half the width between eyes, and including eyes considerably broader than base of mesonotum; rostrum passing the intermediate coxæ; body beneath finely pilose; anterior femora armed with two long spines beneath.

Long., excl. tegm., ♀ 31 mm.; exp. tegm. 102 mm.

Hab. Sumbawa Island (Paris Mus.).

LX.—*British Isopoda of the Families* Ægidæ, Cirolanidæ, Idoteidæ, *and* Arcturidæ. By Canon A. M. Norman, M.A., D.C.L., LL.D., F.R.S., &c.

[Plates XII. & XIII.]

The purpose of this paper is to bring up our knowledge of the Crustacea of the above-named families to the present time. Most of the additions to our fauna are here first made known. In Bate and Westwood's 'Sessile-eyed Crustacea' the numbers of species described were:—Ægidæ 5, Cirolanidæ 4, Idoteidæ 7, Arcturidæ 3 (of these, *Arcturus gracilis* was the male of *A. longicornis*). The following notes record—Ægidæ 10 (one of these, *Æ. rosacea*, a doubtful British species), Cirolanidæ 9, Idoteidæ 11, Arcturidæ 6.

Besides the British Isopods there have been added such species as have been taken by dredging-expeditions of the

British Government in the Mediterranean and North Atlantic. These non-British forms are indicated by the bracket, [, which precedes the name.

In order to obviate frequent full references, the following works and papers will be quoted as "*l. c.*" :—

Bate and Westwood. 'British Sessile-eyed Crustacea' [pp. 209–400, which contain the species here referred to, were published in 1867].

Dollfus (A.). "Les Idoteidæ des côtes de France," Feuille des jeunes Naturalistes, Feb. 1895 *.

Hansen (H. J.). 'Cirolanidæ et familiæ nonnullæ propinquæ Musei Hauniensis,' 1890.

Harger (Oscar). "Report on the Marine Isopoda of New England and adjacent Waters," Rep. U.S. Commiss. Fish and Fisheries, pt. vi., for 1878, published 1880.

Lütken (C. H.). "Nogle Bemærkninger om de nordiske Æga-arter samt om Æga-slægtens rette Begrændsning," Naturhist. Forening Vidensk. Meddelelser, 1858, and Supplement, 1860 (separate copies).

Sars (G. O.). "Prodromus descriptionis Crustaceorum et Pycnogonidarum expeditione Norvegica anno 1875," Archiv Math. og Naturvid. 1876.

——. "Oversigt af Norges Crustaceer med forelabige Bemærkninger over de nye eller mindre bekjendte Arter: I. Podophthalmata, Cumacea, Isopoda, Amphipoda," Christ. Vidensk. Selsk. Forhandl. 1882.

——. 'Norwegian North-Atlantic Expedition, Crustacea,' 1885.

——. 'Account of the Crustacea of Norway,' vol. ii. Isopoda (part referred to published 1897).

Schiödte and Meinert. 'Symbolæ ad Monographiam Cymothoarum Crustaceorum Isopodum Familiæ: I. Ægidæ,' 1879.

I have confined the references given at the head of the species to such works and papers as contain the best illustrations or descriptions of the species, or are in some other way of value, and the localities given are restricted to those from which I have personally identified the species; but an exception is made in order to render what is due to those who have been the first to add any new species to our fauna since the publication of Bate and Westwood's work.

I am indebted to my friend Rev. T. R. R. Stebbing for the use of the illustrations. They were prepared at the time when we jointly published a paper upon some Isopoda †. That paper was intended to be only the first part of a report on the whole order; but so many of the new forms which we

* A shorter paper with the same title was published in the same work in November 1894.

† Norman and Stebbing, "Crustacea Isopoda of the 'Lightning,' 'Porcupine,' and 'Valorous' Expeditions: Part I. Apseudidæ, Tanaidæ, and Anthuridæ," Trans. Zool. Soc. vol. xii. 1886, p. 78.

had at our disposal were just at that time fully described and beautifully illustrated in Professor Sars's great work on the Crustacea of the Norwegian North-Atlantic Expedition, that further publication of our papers was discontinued. As *Ægα megalops*, sp. n., was one of the forms then under our notice, Mr. Stebbing's name is associated with my own as author of the species.

Fam. Ægidæ.

Genus 1. Æga, Leach.

1. *Ægα psora* (Linn.).

1836-49. *Ægα emarginata* (Leach), H. Milne-Edwards, Cuvier's Règne Animal, Crustacés, pl. lxvii. figs. 1–1 *h*.
1858. *Ægα psora*, Lütken, *l. c.* p. 1.
1867. *Ægα psora*, Bate & Westwood, *l. c.* vol. ii. p. 283.
1879. *Ægα psora*, Schiödte & Meinert, *l. c.* p. 357, pl. viii. figs. 5, 6 (the young).
1890. *Ægα psora*, H. J. Hansen, *l. c.* p. 294, pl. ix. figs. 4, 4 *i*.
1897. *Ægα psora*, G. O. Sars, *l. c.* p. 59, pl. xxiv.

North of Scotland (*A. Hancock*); lat. 60° 14′ N., long. 4° 30′ W., 290 fathoms, and lat. 60° 6′, long. 5° 8′ N., 362 fathoms ('Porcupine,' 1869, Stats. 78 and 82, both within the British Area); Kors Fiord, near Bergen, 1878 (*A. M. N.*): all in Mus. Nor.

2. *Ægα ventrosa*, M. Sars. (Pl. XII. figs. 5–8; Pl. XIII. figs. 8, 9.)

1858. *Ægα ventrosa*, M. Sars, "Oversigt norske-arctiske Region forekommende Krybsdyr," Videns. Selskab. Forhandl. p. 35 (separate copy).
1879. *Ægα ventrosa*, Schiödte & Meinert, *l. c.* p. 375, pl. ix. figs. 7–10.
1885. *Ægiochus Nordenskiöldi*, Bovallius, "New Isopod from Swedish Arctic Exped.," Svenska Vet.-Akad. Handl. vol. x. p. 5, pls. i. & ii. (separate copy).
1886. *Ægα Lütkeni*, Bovallius, "New or imperfectly known Isopoda," Svenska Vet.-Akad. Handl. vol. xi. p. 3, pl. i. figs. 1–10 (separate copy).
1886. *Ægiochus ventrosus*, id. ibid. p. 8.
1897. *Ægα ventrosa*, G. O. Sars, *l. c.* p. 64, pl. xxvi. fig. 9.

This species was added to the British fauna in 1869 by the 'Porcupine,' Stats. 74, 75, 78, stations which are all to the west of Shetland, in depths of 203–312 fathoms. I have taken it in Norway in 250–300 fathoms in the Trondhjem and Hardanger Fiords.

3. *Ægа tridens*, Leach.

1860. *Ægа tridens*, Lütken, *l. c.* p. 2 (separate copy).
1867. *Ægа tridens*, Bate & Westwood, *l. c.* vol. ii. p. 281.
1879. *Ægа tridens*, Schiödte & Meinert, *l. c.* p. 340, pl. vii. figs. 1, 2.
1895. *Ægа tridens*, G. O. Sars, *l. c.* p. 60, pl. xxv. fig. 1.

Off Isle of Cumbrae, Firth of Clyde (*D. Robertson*, in Mus. Nor.).

4. *Ægа Strömii*, Lütken.

1834. *Ægа monophthalma*, var., Johnston, Loudon's Mag. Nat. Hist. vol. vii. p. 233, fig. 43 *c*.
1843. *Ægа bicarinata*, H. Rathke (nec Leach), "Beiträge zur Fauna Norwegens," Acta Acad. Cæs. Leop.-Car. Nat. Cur. vol. xx. p. 25, pl. vi. figs. 1–18.
1858. *Ægа Strömii*, Lütken, *l. c.* p. 4, pl. i. figs. 6–8.
1879. *Ægа Strömii*, Schiödte & Meinert, *l. c.* p. 349, pl. vii. figs. 10–15.
1897. *Ægа Strömii*, G. O. Sars, *l. c.* p. 60, pl. xxv. fig. 2.

On fish taken off Whitburn, Co. Durham (*A. Hancock*, in Mus. Nor.) ; a specimen taken lat. 60° 39′ N., long. 3° 9′ W., *i. e.* west of the Shetland Isles, in 203 fathoms ('Porcupine,' 1869, Stat. 74); a co-type specimen from Faroe Islands given me by Dr. Lütken is also in my collection.

This is the British species which has been confused with the next, under which see observations.

5. *Ægа rosacea*, Risso.

1816. *Ægа rosacea*, Risso, Hist. Crust. Nice, p. 140, pl. iii. fig. 9.
1818. *Ægа bicarinata*, Leach, Diction. Sci. Nat. vol. xii. p. 349.
1836–49. *Ægа bicarinata*, H. Milne-Edwards, Cuv. Règ. Anim. pl. lxvii. fig. 2.
1867. *Ægа bicarinata*, Bate & Westwood, *l. c.* vol. ii. p. 278.
1879. *Ægа rosacea*, Schiödte & Meinert, *l. c.* p. 354, pl. x. figs. 5–7.

The most marked distinction between this species and the last consists in the size and position of the eyes, which in *Æ. Strömii* are very large and touch or all but meet each other, while in *Æ. rosacea* they are very small for the genus and are widely separated. *Ægа rosacea* is a well-known Mediterranean species, and further evidence is, I think, required before it can be safely acknowledged as a member of our fauna. The type specimen of Leach, which is figured by Bate and Westwood, was from an unknown locality. Those authors undoubtedly confused two species, since my Durham specimen, which was sent to them for their use, was referred to *Ægа bicarinata*, while it is undoubtedly *Æ. Strömii*. This throws doubt upon the other localities which they give, though, of course, they may refer to Leach's

species (see also Schiödte and Meinert for remarks on this subject).

6. *Æga monophthalma*, Johnston.

1834. *Æga monophthalma*, Johnston, Loudon's Mag. Nat. Hist. vol. vii. p. 232, fig. 43, *a*, *b*.
1867. *Æga monophthalma*, Bate & Westwood, *l. c.* vol. ii. p. 286.
1879. *Æga monophthalma*, Schiödte & Meinert, *l. c.* p. 365.
1897. *Æga monophthalma*, G. O. Sars, *l. c.* p. 62, pl. xxvi. fig. 1.

Mr. Thomas Edward sent me many years ago a specimen to determine from the Moray Firth. I have taken it at Shetland, and received from the late Mr. A. Hancock a fine example procured by him from the fishing-boats at Whitburn, Co. Durham.

7. *Æga crenulata*, Lütken.

1858. *Æga crenulata*, Lütken, *l. c.* p. 6, fig. 4.
1879. *Æga crenulata*, Schiödte & Meinert, *l. c.* p. 343, pl. vii. figs. 6–9.
1897. *Æga crenulata*, G. O. Sars, *l. c.* p. 61, pl. xxv. fig. 3.

A specimen of this species was sent to me for determination by Mr. J. Duncan Matthews. It had been taken in October 1886 from a large shark caught entangled in lines about 8 miles off Stonehaven, Scotland (see Mr. Matthews's record of it, Ann. & Mag. Nat. Hist. ser. 5, vol. xx. 1887, p. 444). A co-type specimen from Greenland, given me by Dr. Lütken, is in my collection.

[*Æga Deshayesiana* (H. Milne-Edwards). (Pl. XII. figs. 1–4; Pl. XIII. figs. 10, 11.)

1840. *Rocinela Deshayesiana*, H. Milne-Edwards, Hist. Nat. Crust. vol. iii. p. 243.
1866. *Æga Deshayesiana*, Heller, Carcinol. Beit. z. Fauna des adriatischen Meeres, p. 22.
1879. *Æga Deshayesiana*, Schiödte & Meinert, *l. c.* p. 360, pl. viii. figs. 7–9.
1885. *Æga Schioedteana*, Bovallius, "New and imperfectly known Isopoda, I.," K. Vet.-Akad. Handl. vol. x. p. 5, pl. i. figs. 1–10.

A specimen of *Æ. Deshayesiana* was taken in the Mediterranean by the 'Porcupine,' 1870, in Bona Bay, N. Africa, in 25–55 fathoms. Only three specimens were known to Schiödte and Meinert.

[*Æga megalops*, Norman and Stebbing, sp. n. (Pl. XIII. figs. 1–7.)

Eyes extremely large, united across the greater part of the head, which they almost entirely occupy, so that very little

besides is to be seen, only a small triangular portion at the back and a little piece at the rostrum (see fig. 2). Moreover, the eye so overhangs the front that this rostral portion is hidden when the *Æga* is viewed from above. The entire surface of the body is closely microscopically punctated, presenting under the microscope a shagreened appearance, besides which there are scattered punctuations of much larger size. The hind margins of the segments of the metasome are beaded (as in *Æga monophthalma*) ; the terminal segment is well rounded at the extremity, its margin serrated and ciliated, its surface covered with minute spinules. The superior antennæ have the joints of the peduncle cylindrical. The coxal plates of the first segment of the mesosome are absent ; those of the three following segments are oblong in form and abruptly truncated at their extremity ; those of the following segments are more produced, their extremities blunt ; nor are the epimera of the metasome sharply pointed. The three anterior pairs of legs (see fig. 5) are almost entirely devoid of spiny armature. The inner uropods are very broad, widely truncated distally, with the outer corner slightly produced, and are without any emargination of the outer side ; both pairs of uropoda are serrated.

Length 13 mm.

A single female taken by the 'Porcupine,' 1870, 8 miles N.W. of Cape Sagres, Portugal, in 45 fathoms.

Genus 2. Rocinela, Leach.

=*Acherusia*, Lucas.

1. *Rocinela danmoniensis*, Leach.

1851. *Æga rotundicauda*, Lilljeborg, "Norges Crustaceer," Œfvers. K. Vet.-Akad. Forhandl. p. 23.
1867. *Rocinela danmoniensis*, Bate & Westwood, *l. c.* vol. ii. p. 291.
1873. *Æga nasuta*, Norman, in Wyville Thomson's 'Depths of the Sea,' p. 127, woodcut.
1879. *Rocinela danmoniensis*, Schiödte & Meinert, *l. c.* p. 383, pl. xi. figs. 1–16.
1890. *Rocinela danmoniensis*, H. J. Hansen, *l. c.* p. 298, pl. x. figs. 1–1 *u*.
1897. *Rocinela danmoniensis*, G. O. Sars, *l. c.* p. 65, pl. xxvii.

Lat. 60° 39′ N., long. 3° 9′ W., 203 fathoms, and lat. 60° 45′ N., long. 3° 6′ W., 250 fathoms, *i. e.* west of the Shetland Isles ('Porcupine,' 1869, Stats. 74, 75). I have taken it on the West Norwegian coast in the Bergen and Hardanger Fiords.

The next species is very closely allied to the present; the chief point of difference is that in *R. danmoniensis* the eyes

are closer together and even touch each other, but that there is considerable variation is evidenced even by Schiödte and Meinert's figures of the male and female.

2. *Rocinela Dumerilii* (Lucas).

1845. *Acherusia Dumerilii*, Lucas, Anim. Artic. d'Algérie, Crustacés, p. 79, pl. viii. fig. 5 *.
1864. *Acherusia complanata*, Grube, Die Insel Lussin und ihre Meeresfauna, p. 76.
1866. *Acherusia Dumerilii*, Heller, Carcinol. Beit. z. Fauna des adriatischen Meeres, p. 22.
1879. *Rocinela Dumerilii*, Schiödte & Meinert, *l. c.* p. 391, pl. xii. figs. 4–9.

Near the Eddystone Lighthouse (Plymouth Biol. Lab. 1899); Adriatic (*Heller*, in Mus. Nor.); Naples (*A. M. N.* 1887).

The Plymouth specimen is of full size, 27 mm. long, an adult male. Schiödte and Meinert describe the "frons" thus:—"*Frons media excavata, bicarinata, ante tridens, dente medio magno producto*"; this relates to "femina ovigera." Lucas in the generic description writes:—"La tête est petite et terminée, dans les mâles, par un front composé de trois tubercules relevés, dont le médian est beaucoup plus prononcé; dans les femelles, la tête est seulement triangulifórme"; and in the specific description "capite in medio fortiter impresso." Schiödte and Meinert say of Lucas's female "sine dubio femina ejus adulta non fuisset, quam ob rem incertum hæret; utrum virginem an marem adolescentem delineaverit." They figure the female, and not the male, and that figure of the female represents the front as "tridens," while their "virgo" has "Frons triangula, apice obtuso, supra æquato." These immature specimens of *Rocinela Dumerilii* may very easily be mistaken for *R. danmoniensis*. The Plymouth adult male has the central area of the head raised considerably above the level of the eyes; this raised part is bounded by elevations which flank the eyes on each side, but the central portion between three lateral elevations is much depressed; in front the rostrum projects forwards and is bent upwards, and on each side of this central point are others of the same form and also bent upwards. This exactly corresponds with the description of Lucas of the same sex†. Bovallius ("New or imperfectly known Isopoda," K. Vet.-Akad. Handl. vol. xi. 1886, p. 9 (separate copy),

* Such is the reference to plate in the text, but my copy has only six plates.

† I fail to understand Schiödte and Meinert's pl. xii. fig. 5, for there the rostrum is represented as bent *downwards*.

pl. ii. figs. 11–19) describes and figures what he calls "the adult male" of *Rocinela Dumerilii*. It measured 20 mm., but the front of the head, instead of having the character which has just been described, is simple, as in immature specimens.

Genus 3. Syscenus, Harger.

=*Harponyx*, G. O. Sars.

Syscenus infelix, Harger.

1880. *Syscenus infelix*, Harger, *l. c.* p. 387.
1882. *Harponyx pranizoides*, G. O. Sars, *l. c.* p. 60, pl. ii. fig. 1 (the young).
1883. *Syscenus infelix*, Harger, "Rep. Dredging 'Blake,' 1880, Isopoda," Bull. Mus. Comp. Zool. vol. xi. p. 100, pl. iii. figs. 5, 5 *a*, pl. iv. figs. 3–3 *h*.
1885. *Rocinela Lilljeborgii*, Bovallius, "New Isopod from the Coast of Sweden," K. Svenska Vet.-Akad. Handl. vol. x. p. 1 (separate copy), pls. i. & ii.
1897. *Syscenus infelix*, G. O. Sars, *l. c.* p. 67, pl. xxviii.

A fine specimen of this species, measuring 36 mm. long, dredged by Sir John Murray in the 'Triton' Expedition of 1882, is now before me. It was taken at Stat. 10, lat. 59° 40′ N., long. 7° 21′ W., in 516 fathoms. This station is in the warm area south of the Wyville-Thomson ridge, and within the British Area. Two other specimens of the species were given me by the describer, Mr. Harger; they were taken off Martha's Vineyard, N.E. America, in 1882, in 640 fathoms.

Fam. Cirolanidæ.

Genus 1. Cirolana, Leach.

1. *Cirolana borealis*, Lilljeborg.

1851. *Cirolana borealis*, Lilljeborg, "Norges Crustaceer," Efvers. K. Vet.-Akad. Handl. p. 23.
1867. *Cirolana spinipes*, Bate & Westwood, *l. c.* vol. ii. p. 299.
1890. *Cirolana borealis*, H. J. Hansen, *l. c.* p. 321, pl. i. figs. 1–1 *o*.
1897. *Cirolana borealis*, G. O. Sars, *l. c.* p. 70, pl. xxix.

Specimens are in my collection from the following localities:—Shetland, Isle of Skye, Cumbrae, South Devon, Guernsey; and off West of Ireland (*A. M. N.*), many dredged off S.W. of Ireland down to 808 fathoms ('Porcupine,' 1869); off Magaro, Norway (*G. O. Sars*); Fosse de Cap Breton, Bay of Biscay (*A. M. N.*); off Cadiz, 386 fathoms, and Adventure Bank, Mediterranean ('Porcupine,' 1870); Spain (*Don Pedro Antiga*); Adriatic (*Professor Heller*).

2. *Cirolana Cranchii*, Leach.

1867. *Cirolana Cranchii*, Bate & Westwood, *l. c.* vol. ii. p. 296.
1890. *Cirolana Cranchii*, H. J. Hansen, *l. c.* p. 341, pl. iii. figs. 3–3 *l.*

This is also *Nerocila Swainsoni*, Leach, = *Eurydice Swainsoni*, H. M.-Edw.

My specimens are from Torquay (*Stebbing*), Plymouth, Polperro, and Cap Breton, Bay of Biscay (*A. M. N.*).

3. *Cirolana Hanseni*, J. Bonnier.

1882. *Eurydice polydendrica*, Norman & Stebbing, MS. in Norman, "Explor. Faroe Channel, 'Knight Errant,'" Proc. Roy. Soc. Edinb. vol. xi. p. 47 (separate copy).
1886. "*Eurydice polydendrica*, Norman & Stebbing," in 'Museum Normanianum, III. Crustacea, no. 428 (nomen nudum).
1896. *Cirolana Hanseni*, J. Bonnier, Résultes Scient. de la Campagne du 'Caudan,' p. 574, pl. xxxii. fig. 1.

This species was taken by the 'Porcupine' Expedition of 1869, N.W. of the Butt of Lewis on the "*Holtenia* ground," Stat. 47, lat. 59° 34′ N., long. 7° 18′ W., 542 fathoms, and near the same place by the 'Triton,' 1882, Stat. 10, lat. 59° 40′, long. 7° 21′, in 516 fathoms, and 'Knight Errant,' 1880, Stat. 7, lat. 59° 58′, long. 7° 22′ W., in 300 fathoms.

[*Cirolana cæca*, A. Dollfus.

1902. *Cirolana cæca*, A. Dollfus, "Note prélim. *Cirolana* de 'l'Hirondelle et 'Princesse Alice,'" Bull. Soc. Zool. de France, p. 6.

A single specimen of *Cirolana cæca*, Dollfus, which curiously I had long had in my cabinet under the same name as a new species, was taken by the 'Porcupine,' 1869, Stat. 36, lat. 48° 50′ N., 11° 9′ W., in 725 fathoms. This station is west of the mouth of the English Channel, and as it is only about 35 miles south of the British Area, it will probably be hereafter added to our fauna.

[*Cirolana neglecta*, H. J. Hansen.

1890. *Cirolana neglecta*, H. J. Hansen, *l. c.* p. 327, pl. i. figs. 3, 3 *a*, pl. ii. figs. 1–1 *b*.

I have this species of Hansen from Tangier Bay ('Porcupine,' 1870), Adriatic (*Prof. Claus*), and Cap Breton, Bay of Biscay (*A. M. N.*).

Genus 2. Conilera, Leach.

Conilera cylindracea (Montagu).

1867. *Conilera cylindracea*, Bate & Westwood, *l. c.* vol. ii. p. 304.
1890. *Conilera cylindracea*, H. J. Hansen, *l. c.* p. 358, pl. iv. figs. 5–5 *c*, and pl. v. figs. 1–1 *d*.

I have this species in my collection from the Minch, Skye, Firth of Clyde, Plymouth, Polperro, Jersey (*A. M. N.*). It extends southwards to the Mediterranean, being recorded by Hansen from Naples. I am not aware of any record of this species having been found on the north-east coast of England or east coast of Scotland, nor is it known in Denmark or Norway. This seems remarkable, as the Isopod feeds on the flesh of living as well as dead fish, and thus would have such a ready means of being transported to great distances.

Genus 3. Eurydice, Leach.

1. *Eurydice pulchra*, Leech.

1867. *Eurydice pulchra*, Bate & Westwood, *l. c.* vol. ii. p. 310.
1890. *Eurydice pulchra*, H. J. Hansen, *l. c.* p. 370, pl. vi. figs. 3–3 *i*.
1897. *Eurydice pulchra*, G. O. Sars, *l. c.* p. 73, pl. xxx. fig. 2.

It is also *Slabberina agata*, Van Ben., *Slabberina agilis*, G. O. Sars, and *Slabberina gracilis*, Bovallius.

A very active swimmer, usually occurring near the shore in sandy bays, but also in the open sea.

Specimens in my collection are from off the mouth of the Tees (*G. S. Brady*), Banff (*T. Edward*), Arran, Firth of Clyde (*D. Robertson*), Westport, Co. Mayo (*A. M. N.*). I have also taken it at Shetland and off the coasts of Northumberland and Durham.

2. *Eurydice truncata* (Norman).

1868. *Cirolana truncata*, Norman, "Two Isopods, belonging to Genera *Cirolana* and *Anilocra*, new to British Islands," Ann. & Mag. Nat. Hist. ser. 4, vol. ii. p. 421, pl. xxiii. figs. 12–15.
1895. *Eurydice truncata*. H. J. Hansen, Isopoden, Cumaceen, und Stomatopoden der Plankton-Exped. p. 13, pl. i. figs. 5–5 *h*.

The type specimen was taken by me in 1867 in St. Magnus Bay, Shetland. Other specimens in my collection are from the 'Knight Errant' dredgings of 1880, Stat. 3, lat. 59° 28′ N., long. 6° 33′ W., in 178 fathoms; from the slope of the English Channel in 725 fathoms ('Porcupine,' 1869, Stat. 36) off South Devon, and near the mouth of the English Channel (*Dr. Gough*); Naples (*A. M. N.*). The specimen which Dr. Hansen described was also taken at Naples.

3. *Eurydice Grimaldii*, Dollfus.

1888. *Eurydice Grimaldii*, Dollfus, "Troisième campagne de 'l'Hirondelle,' 1887, Isopodes du littoral des Açores," Bull. Soc. Zool. de France, p. 6, with woodcut.
1890. *Eurydice elegantula*, H. J. Hansen, *l. c.* p. 364, pl. v. figs. 2–2 *t*.

"Lat. 58°–60° N., long. 5°–14° W." (co-types of *E. elegantula* from Copenhagen Museum); lat. 54° 28′ N., long. 11° 44 W., which is 'Porcupine,' 1869, Stat. 17 (*Davison*), and 'Porcupine,' 1870, Stat. 29, off Cadiz, in 227 fathoms: all in Mus. Nor.

4. *Eurydice spinigera*, H. J. Hansen.

1890. *Eurydice spinigera*, H. J. Hansen, *l. c.* p. 367, pl. v. figs. 4–4*c*, pl. vi. figs. 1–1*c*.

Jersey (*Sinel*, in Mus. Nor.), Whitsand Bay, Plymouth, 1903 (*A. M. N.*). Rev. T. R. R. Stebbing has previously recorded the species as British, having taken it in the harbour at Ilfracombe (Ann. & Mag. Nat. Hist. ser. 6, vol. xv. 1895, p. 24).

5. *Eurydice inermis*, H. J. Hansen.

1890. *Eurydice inermis*, H. J. Hansen, *l. c.* p. 366, pl. v. figs. 3–3*f*.

A single specimen dredged by me in 1903 near the Eddystone Lighthouse when in the Plymouth Biol. Lab. Steamer (*A. M. N.*). The three type specimens in the Copenhagen Museum on which the species was founded had been taken off "Cap Lizard."

*** Dr. Hansen has at the present time a paper of revision of European Cirolanidæ in the hands of the Linnean Soc. for publication. It will contain notes on some of the foregoing species, and, moreover, descriptions of at least one new *Cirolana* and one new *Eurydice* which have been procured so near to the British coasts that they may reasonably be expected hereafter to be added to our fauna.

Fam. Idoteidæ.

Professor Sars has substituted the spelling *Idothea* for that of *Idotea* which has hitherto been generally adopted. The generic name is first found in the 'Index Alphabeticus' of J. C. Fabricius, 1796, p. 86, where he introduces among the names of those genera which he had already published in the 'Entom. Syst.' others which he intended afterwards to describe in his supplement: these are mere "nomina nuda"; all that we find is "*Idothea*, S.," implying that the genus will be described in the supplement. The 'Supplementum Entom. Syst.,' 1798—published two years after the Index just referred to,—contains at p. 302 the description of the

genus; and at the head of this description the name stands *Idotea*, and that this was no accidental error is proved by the same spelling being repeated in a footnote "*Idoteæ*." But in the 'Index Alphabeticus' of that supplement, published in the following year (1799), we find again the spelling *Idothea*. Thus the Indexes give *Idothea*, but the name with the description is *Idotea*. There seems therefore room for a divergence of opinion as to which spelling should be more properly employed. It appears to me right to retain the spelling *Idotea*—first, because this is the spelling which is used, and intentionally used, with the description; secondly, because it is the spelling which has been almost universally employed for a hundred years; and, thirdly, because *Idotea* is more euphonious than *Idothea*. The name itself appears to be a "nomen proprium" without any derivation.

Genus 1. Idotea, J. C. Fabricius.

In my paper "A Month on the Trondhjem Fiord" (Ann. & Mag. Nat. Hist. ser. 6, vol. xiii. 1894, p. 279) I called attention to several distinct varieties of what was there called *Idotea marina* (=*I. balthica*). These varieties have been elevated by Sars to specific rank, and the Mediterranean form, my "var. *d*," must equally with these be regarded as a species and bear the name *I. Basteri*, Audouin. As long ago as 1777, Pennant regarded two forms on our coast as distinct species and named them *Oniscus marinus* (=*I. granulosa*, Rathke) and *O. entomon* (=*I. balthica*, Pallas).

1. *Idotea balthica* (Pallas).

This is *Idotea tricuspidata*, Desmarest and Bate and Westwood, *I. tridendata*, Rathke, and *I. marina*, Miers and Norman (*l. c.*). On the N.E. American coast it has been known as *I. irrorata* (Say), under which name I have specimens from Vineyard Sound (*Mr. Harger*) and lat. 40° 06′ N., long. 68° 01′ W. (Smithsonian Institute). Professor Sars considers the *Oniscus marinus*, Linné, to be what we have known as *Iæra albifrons* and not an *Idotea*, and has followed Fabricius in applying the specific name to the former species.

I. balthica is the species figured by Bate and Westwood under the name *I. tricuspidata* (vol. ii. p. 379). It is found all round our coasts.

2. *Idotea granulosa*, Rathke.

1843. *Idotea granulosa*, Rathke, Beiträge zur Fauna Norwegens, p. 23.

1851. *Idotea entomon*, Dalyell (nec Linné), Powers of the Creator, &c. vol. ii. pl. lxiii. fig. 9.
1897. *Idothea granulosa*, G. O. Sars, *l. c.* p. 82, pl. xxxiv. fig. 1.

This form, hitherto confused with the last, has been found by me at Hartley, Northumberland, and occurred among some Crustacea taken at Berehaven, Ireland, and sent to me by Professor Haddon for identification.

3. *Idotea neglecta*, G. O. Sars.

1895. *Idotea marina*, Dollfus, *l. c.* p. 7, fig. 22.
1897. *Idothea neglecta*, G. O. Sars, *l. c.* p. 84, pl. xxxv. fig. 1.

I have for many years doubted whether this should be regarded as a variety of *I. balthica* or a distinct species. The following circumstance has satisfied me that Sars is right in separating it:—*I. balthica* and the present form occur at times in great profusion at Plymouth. At my request the Director of the Marine Laboratory sent me a large bottle full of specimens; there were many hundred specimens of each form (*I. balthica* and *I. neglecta*) of all ages, and I was able to separate the specimens of all ages without hesitation as to a single example. I also have specimens from Shetland and Falmouth, and found it in four localities on the Norwegian coast, ranging from Bergen Fiord to Vadsö, Finmark. Dr. Thomas Scott has just recorded its occurrence in the Moray Firth ('Twenty-second Report Fishery Board for Scotland,' 1904, p. 257).

4. *Idotea viridis*, Slabber.

1778. *Oniscus viridis*, Slabber, Naturk. verlistigengen, p. 104, pl. xii. figs. 4, 5.
1889. *Idotea phosphorea*, Hoek (nec Harger), Crustacea Neerlandica, ii. (Tijds. Ned. Dierk. Ver. (2) Deel ii.) 1889, p. 7, pl. vii. figs. 2 & 2*r*.
1895. *Idotea salinarum*, Dollfus, *l. c.* p. 7, fig. 21.
1897. *Idothea viridis*, G. O. Sars, *l. c.* p. 83, pl. xxxiv. fig. 2.

This elongated and narrow species is essentially an inhabitant of brackish water. My finest specimens are from Aldeburgh, Suffolk, and I have received it from Mr. W. Bateson, who took it at Southwold on the same coast. I have also found it in Arnold's Pond, Guernsey, and in the Fleet at Weymouth.

5. *Idotea pelagica*, Leach.

1867. *Idotea pelagica*, Bate & Westwood, *l. c.* vol. ii. p. 384.
1895. *Idotea pelagica*, A. Dollfus, *l. c.* p. 8, fig. 23.
1897. *Idothea pelagica*, G. O. Sars, *l. c.* p. 81, pl. xxxiii.

This appears to be scarce on our coasts. I have it only from the south-west of Ireland; and some specimens given me by Dr. Thos. Scott, which were found at Aberdeen.

6. *Idotea metallica*, Bosc.

1802. *Idotea metallica*, Bosc, Hist. Nat. des Crust. vol. ii. p. 179, pl. xv. fig. 6.
1846. *Idotea robusta*, Kröyer, Naturhist. Tidssk. ser. 2, vol. ii. p. 108, Voyage en Scand. &c. pl. xxvi. fig. 3.
1880. *Idothea robusta*, Harger, Rep. U.S. Commiss. Fish and Fisheries, p. 349, pl. vi. figs. 30–32.
1895. *Idotea metallica*, Dollfus, *l. c.* p. 8, fig. 24.

Among Crustacea from off S.W. Ireland which Professor Haddon sent me to name some years ago was a single specimen of this free-swimming plankton species. It is thus added to the British fauna. It has a wide range over the Atlantic, and occurs also in the Mediterranean Sea. Specimens in my own collection are from Rhode Island and Vineyard Sound (*S. I. Smith*), lat. 55° 49′ N., long. 16° 44′ W. ('Valorous,' 1876); Mediterranean ('Porcupine,' 1870).

7. *Idotea emarginata*, Fabricius.

1867. *Idotea emarginata*, Bate & Westwood, *l. c.* vol. ii. p. 286.
1895. *Idotea emarginata*, Dollfus, *l. c.* p. 6, figs. 17, 18.
1897. *Idothea emarginata*, G. O. Sars, *l. c.* p. 85, pl. xxxv. fig. 2.

This occurs apparently all round our coasts. My own examples are from Skye, Whitby, Plymouth, and Ardbear Bay, Ireland; and I have taken it at other places—for example, the coasts of Durham and Northumberland.

8. *Idotea linearis* (Pennant).

1846. *Idothea sexlineata*, Kröyer, Naturhist. Tidssk. ser. 2, vol. ii. p. 88, Voyage en Scand. &c. pl. xxvi. fig. 1.
1867. *Idotea linearis*, Bate & Westwood, *l. c.* vol. ii. p. 388.
1895. *Idotea linearis*, Dollfus, *l. c.* p. 6, fig. 16.

I have taken this species in the following localities:—Durham coast, the Humber, Exmouth, Plymouth, Falmouth, Guernsey, Jersey, and Cape Breton, Bay of Biscay; I have also specimens from the Roach River, Essex (*Dr. Baird*), and Valencia, Spain (*Don Pedro Antiga*).

Genus 2. Zenobiana, Stebbing, 1895.

= *Zenobia*, Risso.

The name *Zenobia* had been twice used before Risso

instituted his genus. Stebbing supplied *Zenobiana* (Ann. & Mag. Nat. Hist. ser. 6, vol. xv. 1895, p. 24 *).

Zenobiana prismatica (Risso).

1826. *Zenobia prismatica*, Risso, Hist. Nat. de l'Europe Mérid. vol. v. p. 110, pl. v. fig. 24.
—— ? *Idotea chelipes*, O. G. Costa, Fauna del regno di Napoli, *Idotea*, p. 2, pl. xi. fig. 2 *a*, *b*, *c*.
1867. *Idotea parallela*, Bate & Westwood, *l. c.* vol. ii. p. 391.
1895. *Idotea prismatica*, Dollfus, *l. c.* p. 9, fig. 25.

I have procured this species at Falmouth and have received it from Paignton (*Rev. T. R. R. Stebbing*), Jersey (*Sinel*), and the Adriatic (*Prof. Claus*).

Genus 3. Stenosoma, Leach.

1. *Stenosoma lanciferum*, Leach (MSS.).

1867. *Idotea appendiculata*, Bate & Westwood (nec Risso), *l. c.* vol. ii. p. 396.
1895. *Stenosoma lancifer*, Dollfus, *l. c.* p. 5, fig. 13.

Tide-marks, Exmouth (*A. M. N.*); Polperro, Cornwall (*Laughrin*); Ilfracombe (*Rev. T. R. R. Stebbing*): all in Mus. Nor.

2. *Stenosoma acuminatum*, Leach.

1837. *Idotea acuminata*, Bate & Westwood, *l. c.* vol. ii. p. 394.
1895. *Stenosoma acuminatum*, Dollfus, *l. c.* p. 5, fig. 14.

I have never seen this species. It is not *Idotea capito*, Rathke, which Bate and Westwood give as a synonym. *Stenosoma capito* I have from the Adriatic (*Prof. Heller*).

Fam. **Arcturidæ.**

Genus 1. Arcturus, Latreille.

[*Arcturus baffini* (Sabine).

1824. *Idotea baffini*, Sabine, Appendix Parry's Voyage, vol. iv. p. 50, pl. i. figs. 4, 5, 6.
1840. *Arcturus baffini*, H. M.-Edwards, Nat. Hist. Crust. vol. iii. p. 123, pl. xxxi. fig. 1.
1836–49. *Arcturus baffini*, H. M.-Edwards, Règne Animal d'après Organ. Cuvier, Crustacés, pl. lxx. fig. 2.
1876. *Arcturus baffini*, Wyville Thomson, The Depths of the Sea, p. 127.
1885. *Arcturus baffini*, G. O. Sars, *l. c.* p. 97, pl. ix. figs. 1–21.

* The genus occurs in the middle of a paragraph, which is scarcely fair to recorders. It is not therefore noticed in 'Zool. Record.'

This fine species would seem to be subject to an amount of variation which is very unusual, or else there are several closely allied forms. I prefer to regard these forms as varieties. If hereafter writers are of a different opinion, the names here employed can be raised to specific rank.

[Var. 1. *typica.*

It is this form which all the figures above referred to illustrate. It is furnished with highly elevated, conical, spiniformed processes, arranged in transverse pairs and developed on all the segments of the body. The figure in 'The Depths of the Sea' is excellent, and illustrates the habit of the genus in carrying its young attached to the antennæ. The specimen which the figure referred to illustrates was taken by the 'Porcupine' Expedition, 1869, Stat. 59, lat. 60° 21′ N., long. 5° 41′ W., in 580 fathoms—that is, in the cold area of the Faroe Channel. My own collection contains specimens from Baffin's Bay (*Albany Hancock*) and Greenland (*D'Arcy Thompson*).

[Var. 2. *intermedia.*

In this variety the tubercles are greatly reduced in size and elevation on the head and first four segments of mesosome, but on the fifth and succeeding segments they are as well represented as in the typical form. Baffin's Bay (*Albany Hancock*, in Mus. Nor.).

[Var. 3. *tuberosus*, G. O. Sars.

1876. *Arcturus tuberosus*, G. O. Sars, *l. c.* p. 350.
1877. *Arcturus baffini*, var., *Feildeni*, Miers, "Report Crust. Arctic Exped. 1875–1876," Ann. & Mag. Nat. Hist. ser. 4, vol. xx. p. 14, pl. iii. fig. 1.
1885. *Arcturus tuberosus*, G. O. Sars, *l. c.* p. 102, pl. ix. fig. 22.

"Without distinctly perceptible hairs and without dorsal spines, but presenting an irregular rugged surface" (*G. O. Sars*). The type of Sars measured 35 mm., but I have seen an example 60 mm. Greenland (*D'Arcy Thompson*, in Mus. Nor.).

[*Arcturus scabrosus*, sp. n.

In general character as *A. baffini*, but somewhat more stoutly built. Dorsal surface entirely devoid of spines or elevated tubercles, but extremely rugged, covered with depressed nodules; the entire surface, including the nodules, covered with granules of considerable size. These granules not only cover

the entire dorsal surface, but are present also on the peduncles of the antennules, the epimera of the last three segments, and the legs. They are especially conspicuous upon the metasome, where the individual granules, lying in one direction (backwards), are more clearly separable than on other parts of the body, and when viewed under the microscope each is seen to bear a minute cilium. The epimera of the last three segments are more widely rounded distally than in var. *tuberosus* of the last species. The peduncles of the antennules are not only covered with granules, but bear setæ which are more developed than is usual in forms of *A. baffini*. Length 35 mm. This form is so markedly distinct from *A. baffini* that it would certainly seem to be a good species. I have seen several specimens which were taken by Sir John Murray on H.M.S. 'Triton' in 1882. It was dredged in the cold area of the Faroe Channel, Stat. 4, lat. 60° 22′ N., long. 8° 21′ W., in 327 to 430 fathoms (Mus. Nor.).

Arcturus hystrix, G. O. Sars.

1876. *Arcturus hystrix*, G. O. Sars, *l. c.* p. 350.
1885. *Arcturus hystrix*, G. O. Sars, *l. c.* p. 104, pl. ix. figs. 23–26.
1901. *Arcturus hystrix*, Ohlin, "Arctic Crustacea, Leptostraca, Isopoda, Cumacea," K. Svenska Vet.-Akad. Handl. vol. xxvi. p. 30, pl. ii. fig. 6 *a*, pl. iii. figs. 6 *b–k*.

'Porcupine,' 1869, Stat. 50, lat. 59° 54′ N., long. 7° 52′ W., 355 fathoms, and Stat. 59, lat. 60° 21′ N., long. 5° 41′ W., 580 fathoms. The first of these localities is just within the British Area, the second is in the cold area of the Faroe Channel.

Genus 2. Arcturella, G. O. Sars.

1. *Arcturella dilatata*, G. O. Sars.

1882. *Astacilla dilatata*, G. O. Sars, *l. c.* p. 63, pl. ii. fig. 3.
1897. *Arcturella dilatata*, G. O. Sars, *l. c.* p. 92, pl. xxxviii.

My late friend Dr. D. Robertson found this many years ago, as recorded by him in his 'Cat. Amphip. and Isop. of the Clyde,' pt. 2, p. 28, in 20 fathoms off Blackwaterfoot, Isle of Arran, and kindly sent me specimens. Dr. Thomas Scott has given me examples from off Fair Isle, that is between Shetland and Orkney, and from the Copenhagen Museum I have received Danish specimens.

2. *Arcturella damnoniensis* (Stebbing).

1874. *Arcturus damnoniensis*, Stebbing, "A new Species of *Arcturus*," Ann. & Mag. Nat. Hist. ser. 4, vol. xiii. pl. xv.

This would seem to be a southern species. In my collection are co-types from Torbay (*Stebbing*), specimens collected at Exmouth (*C. Parker*), and others taken by myself at Ilfracombe, Plymouth, and Naples.

Genus 3. Astacilla, Cordiner, 1795.

= *Leacia*, Johnston, 1825.

1. *Astacilla longicornis* (Sowerby).

1867. *Arcturus longicornis*, Bate & Westwood, *l. c.* vol. ii. p. 365, ♀.
1867. *Arcturus gracilis* (Goodsir), Bate & Westwood, *l. c.* vol. ii. p. 373, ♂.
1897. *Astacilla longicornis*, G. O. Sars, *l. c.* p. 88, pl. xxxvi.

Inhabiting all our coasts, Shetland, the Minch, Forth of Clyde, Firth of Forth, Northumberland coast, South Devon, Guernsey, Valentia, Ireland; also Trondhjem Fiord and Tromso, Norway: all in Mus. Nor.

2. *Astacilla intermedia* (H. Goodsir).

1841. *Leachia intermedia*, H. D. S. Goodsir, Edinb. New Phil. Journ. vol. xxxi. p. 309, pl. vi. figs. 1–3.
1867. *Arcturus intermedius*, Bate & Westwood, *l. c.* vol. ii. p. 371.
1869. *Arcturus affinis*, G. O. Sars, "Nye Dybvandscrustaceer fra Lofoten," Christ. Viden. Selsk. Forhandl. p. 163.
1897. *Astacilla affinis*, G. O. Sars, *l. c.* p. 90, pl. xxxvii. fig. 2.

Notwithstanding some discrepancies in the description, I think that there can be little doubt that Sars's species, which I obtained also in our seas and in Goodsir's locality, is that which was named by H. Goodsir. That author describes and figures the last joint of the antennæ "globose" or, according to the figure, claviform; this appearance may have been caused by the olfactory filaments clinging to the joints and appearing as part of it.

Examples in my collection are from the following sources:—Firth of Forth, *i. e.* Goodsir's locality for his species (*Dr. Henderson*); Durham coast (*A. M. N.*); off S.W. Ireland, 100–200 fathoms ('Porcupine,' 1869); off Fair Island, between Orkney and Shetland (*Dr. Thos. Scott*); Norway (co-types of *A. affinis* from G. O. Sars); Tromsö (*Schneider*).

3. *Astacilla Deshayesii* (Lucas).

1849. *Arcturus Deshayesii*, Lucas, Anim. Artic. de l'Algérie, p. 59, pl. v. fig. 7.
1874. *Arcturus gracilis*, Stebbing (nec Goodsir), "Sessile-eyed Crustacea of Devon," Trans. Devon. Assoc. Advanc. Science, p. 8, figs. 2–4 (separate copy).
1878. *Arcturus linearis*, Stebbing, "Notes on Sessile-eyed Crustacea," Ann. & Mag. Nat. Hist. ser. 5, vol. i. p. 36.

This species was added to the British fauna by Mr. Stebbing, who at first referred it to *A. gracilis*, but subsequently renamed it *Arcturus linearis*, but in Hist. Crust. 1898, p. 371, drops *A. linearis* and uses *A. Deshayesii*. The female is easily recognized by the single tubercle on the front half of the fourth segment of the mesosome. In the male there is often a slight swelling of the integument in the same position, but at other times the swelling is absent. Specimens in my collection are from Torbay (*Stebbing*, co-types of his species), Salcombe, Devon, and Plymouth (*A. M. N.*), west of Gibraltar, and from the Adriatic (*Prof. Claus*).

[*Astacilla granulata*, G. O. Sars.

1876. *Leachia granulata*, G. O. Sars, *l. c.* p. 351.
1878. *Astacilla americana*, Harger, Amer. Journ. Science & Arts, ser. 3, vol. xv. p. 374.
1879. *Astacilla granulata*, Harger, Proc. U.S. Nat. Mus. vol. ii. p. 161.
1880. *Astacilla granulata*, Harger, *l. c.* p. 364, pls. viii., ix. figs. 48–52.
1885. *Astacilla granulata*, G. O. Sars, *l. c.* p. 107, pl. ix. figs. 27–35.

This very pretty species, which looks as if it was clothed with a garment thickly embroidered with pearls, was dredged by the 'Lightning' Exped. of 1868, Stat. 3, lat. 60° 31′ N., long. 9° 18′ W., in 229 fathoms; and by the 'Porcupine' in 1869, Stat. 59, lat. 60° 21′ N., long. 5° 41′ W., in 580 fathoms: both these stations are to the north of the British Area.

EXPLANATION OF THE PLATES.

Plate XII.

Fig. 1. *Æga Deshayesiana*, H. Milne-Edwards.
Fig. 2. Ditto. Head seen from below.
Fig. 3. Ditto. Palp of mandible.
Fig. 4. Ditto. Outer uropod.
Fig. 5. *Æga ventrosa*, M. Sars.
Fig. 6. Ditto. Head seen from below.
Fig. 7. Ditto. Palp of mandible.
Fig. 8. Ditto. Telson and uropods.

Plate XIII.

Fig. 1. *Æga megalops*, Norman and Stebbing.
Fig. 2. Ditto. Head seen from below.
Fig. 3. Ditto. End of palp of mandible.
Fig. 4. Ditto. Maxillipeds.
Fig. 5. Ditto. First foot.
Fig. 6. Ditto. Last foot.
Fig. 7. Ditto. Telson and uropods.
Fig. 8. *Æga ventrosa*, M. Sars. First foot.
Fig. 9. Ditto. Last foot.
Fig. 10. *Æga Deshayesiana*, H. Milne-Edwards. First foot.
Fig. 11. Ditto. Last foot.

LXI.—*British Land Isopoda.—Second Supplement.*

By Canon A. M. Norman and Professor G. S. Brady.

For former notices on the Land Isopoda, see Ann. & Mag. Nat. Hist. ser. 7, vol. iii. 1899, p. 70, and vol. xi. 1903, p. 369.

Great success has attended Professor Brady's hunts for woodlice during the last few months in Westmorland and Durham. He has added two species to our fauna, and met with others previously known in our Islands only from a single far removed locality.

Haplophthalmus danicus, Budde-Lund.

This interesting species, recorded in 1899 as occurring in the garden of A. M. N. at Berkhampsted, Herts, has just been found by G. S. B. at Humbledon Hill, near Sunderland.

Haplophthalmus Mengei, Zaddach.

This was added to our fauna last year, having been found by A. M. N. in Co. Clare, Ireland. G. S. B. has this autumn added it to the English fauna from Fulwell Quarry, near Sunderland.

Trichoniscoides albidus (Budde-Lund).

1879. *Trichoniscus albidus*, Budde-Lund, "Prospectus gen. et spec. Crust. Isop. terrest.," Naturhist. Tidssk. ser. 3, vol. xii. p. 469.
1885. *Trichoniscus albidus*, Budde-Land, Crust. Isop. terrest. p. 248.
1898. *Trichoniscoides albidus*, G. O. Sars, Crust. of Norway, vol. ii. Isopoda, p. 165, pl. lxxiii. fig. 2.

A *Trichoniscus* taken by G. S. B. at Carley Hill Quarry, near Sunderland, has been compared with co-types of *Trichoniscus pygmæus*, G. O. Sars, and specimens of *Trichoniscoides albidus*, for which we are also indebted to our kind friend Professor Sars. In general appearance these two species seem to greatly resemble each other, but the Sunderland specimens agree with the latter in the shorter and wider form of the maxilliped, in the blunt stumpy spines of the last two joints of the peduncle of the antennæ, and in the more strongly tuberculated head and its lateral lobes and of the body-segments generally. On the other hand, the flagellum of the antennæ is three-jointed, and Sars represents it in this species as four-jointed, while that of *Trichoniscus pygmæus* is three-jointed. On turning,

however, to Budde-Lund we find the flagellum of his *Trichoniscus albidus* described as "*bi–triarticulatum.*" The species was previously known only in Norway and Denmark, and is an addition to our fauna.

Porcellio Rathkei, Brandt.

1833. *Porcellio Rathkei*, Brandt, Conspectus Monogr. Crust. Isop. terrest. p. 15.
1853. *Porcellio trivittatus*, Lereboullet, Mém. Crust. Fam. Cloportides, p. 54, pl. i. figs. 13, 14, pl. iii. figs. 66–70.
1885. *Porcellio Rathkei*, Budde-Lund, Crust. Isop. terrest. p. 85.
1898. *Porcellio Rathkei*, G. O. Sars, Crust. of Norway, vol. ii. Isopoda, p. 180, pl. lxxix. fig. 1.

A single adult specimen taken by G. S. B. at Humbledon Hill, near Sunderland; new to the British fauna. *P. Rathkei* has a range over the greater part of the northern portion of the Continent of Europe, and is known as far east as Transcaucasia. It has been found also in N. America, near New York and near Niagara.

Other synonyms of this species are *P. ferrugineus*, Brandt, *P. trilineatus*, *P. tetramœrus* and *striatus*, Schnitzer, *P. sylvestris*, Schöbl.

Armadillidium pulchellum (Zencker).

This *Armadillidium*, which was added to the British fauna by Dr. Scharff, who found it at Sligo, has this year been obtained by G. S. B. at Arnside, Westmorland.

In the paper referred to at the commencement of these notes as published in 1899, a list was given of all Land Isopoda found in the northern countries of Europe; the number occurring in each country was as follows:—Norway, 17; Sweden, 13; Denmark, 20; Holland, 11; Belgium, 17; British Isles, 20. This last number has now been raised to 25. The only species which are found in the other northern countries, but as yet are not known in ours, are *Trichoniscus pygmœus*, G. O. Sars (Norway); *Armadillidium pictum*, Brandt (Sweden, Norway, Denmark, and Belgium); *Armadillidium opacum*, Koch (Denmark); and *Armadillidium sulcatum*, M.-Edw. (Belgium).

Two of the British species, *Armadillidium nasutum*, Budde-Lund, and *A. depressum*, Brandt, have not yet been met with in any of the countries above mentioned.

From the species which have been found in the neighbourhood of Sunderland, as recorded in the foregoing notes, it would seem as if the Magnesian Limestone of the district was favourable to the life of Land Isopoda.

LXII.—*On von Heuglin's, Rüppell's, and Sundevall's Types of African* Rhinolophi. By Knud Andersen.

Owing to the most obliging kindness of Professor Dr. Kurt Lampert, Royal Natural History Cabinet, Stuttgart, Dr. Fritz Roemer, Museum Senckenberg, Frankfurt-a.-M., and Professor Dr. Ejnar Lönnberg, Riksmuseum, Stockholm, I have had the opportunity of examining the types of von Heuglin's *Rhinolophus macrocephalus, acrotis*, and *minimus*, of Rüppell's *Rh. fumigatus*, and of Sundevall's *Rh. auritus*. In returning my sincere thanks to the above-named Directors and Keepers of Continental Museums I, in the following, give a summary of the results at which I have arrived.

Rhinolophus fumigatus, macrocephalus, and *Antinorii*.

Rh. fumigatus *.—There are two cotypes (mounted specimens, adult individuals) preserved in the Frankfurt Museum, labelled "Schoa in Abyssinien; Geschenk von Dr. Rüppell, 1841; No. II. F. 7. *a* & *b*." Besides these specimens I have had for examination, through the generosity of Prof. Lönnberg, a beautifully mounted topotype from the collection of the Stockholm Museum †. Peters ‡, who examined one of the cotypes (no doubt that specimen which still, on the back of the wooden block, bears the words "29 Decbr. 1865, Berlin," written in pencil), found it exactly like *Rh. ferrum-equinum* but for two small points of difference: *Rh. fumigatus* was stated to have the posterior connecting-process still shorter and the base of the hairs of the underside dull brown ("dunkelbraun"). Dobson § put the name down as a synonym to *Rh. ferrum-equinum*.

Rh. macrocephalus ||.—Two cotypes (in alcohol) preserved in the Stuttgart Museum, labelled "No. 1059; Abyssinien, v. Heuglin; 1863." Dobson ¶ regarded this bat as "a small form of *Rh. ferrum-equinum* with dark coloured fur."

* Rüppell, "Beschreibung mehrerer neuer Säugethiere, in der zoologischen Samulung der Senckenbergischen naturforschenden Gesellschaft befindlich," Mus. Senck. iii. (1842) p. 132 (conf. also p. 155).

† This is the specimen referred to by Sundevall as "ab ipso Rüppelio missus" (Kgl. Sv. Vet.-Akad. Handl., new series, vol. ii. pt. 2, no. 10 (1858), p. 13). It is labelled "Mam. Ex. no. 1594."

‡ Peters, MB. Akad. Berlin, 1866, pp. 17–18; conf. also *op. cit.* 1871, p. 311; and C. von der Decken, 'Reisen in Ost-Afrika,' iii. 1 (1869), Taf. ii. fig. 3.

§ Dobson, Cat. Chir. Brit. Mus. (1878) p. 119.

|| Von Heuglin, 'Reise in Nordost-Afrika,' ii. (1877) pp. 22–23.

¶ Dobson, "Report on Accessions to our Knowledge of the Chiroptera during the past two years (1878–80)," Rep. Brit. Assoc. 1880, p. 10.

Results.—*Rh. fumigatus* and *Rh. macrocephalus* are based upon individuals of the same species: the types of both agree exactly with each other to the smallest details; but they are certainly *toto cœlo* different from *Rh. ferrum-equinum*. *They are the same species as*, later on, *described by Dobson* under the name Rh. Antinorii.* From *Rh. ferrum-equinum* they differ principally in the following points:—(1) The horse-shoe is very much broader, covering almost the whole of the muzzle, and differently formed; (2) the sella is much broader, only very slightly (scarcely perceptibly) constricted below the middle, its lateral margins subparallel (in *Rh. ferrum-equinum* the sella is strongly pandurate); (3) the front face and the lateral margins of the sella are densely covered with long straight hairs, one of the most striking peculiarities of "*Rh. Antinorii*" and its nearest allies, the large *Rh. Hildebrandti* and the West-African *Rh. æthiops* (in *Rh. ferrum-equinum* the front face of the sella is perfectly devoid of hairs); (4) the ears are very much broader, scarcely attenuated below the tip, the tip itself blunt; (5) there are important differences in the proportionate length of the forearm, metacarpals, and phalanges as compared with the corresponding bones of *Rh. ferrum-equinum*; (6) the tail (which is complete in all the specimens examined) is extremely short, 21–26·8 mm., in *Rh. ferrum-equinum* (31 specimens from Europe) 34–40 mm.; (7) one of Rüppell's cotypes is mounted with the mouth sufficiently open as to give a view of the anterior portion of the tooth-rows: the upper canine and p^4 are so closely approximated, their cingula being in immediate connexion with each other, and the distance between their tips exactly the same as in "*Rh. Antinorii*," that it may safely be said that there is no rudimentary upper p^2; when, however, the upper p^2 is wanting, the same is the case with the lower p_3, this latter being invariably lost before the upper p^2. As to the types of *Rh. macrocephalus*, the one specimen is adult, with no trace of the lower p_3 nor of the upper p^2; the second specimen is a young individual without the lower p_3, but having on both sides of the upper jaw a p^2 so exceedingly minute as only to be perceptible under a strong lens, and situated not only exterior to the tooth-row, but quite on the outer side of the maxillary bone, above the adjacent teeth, thus proving (what, indeed, might have been expected) that the tooth which is constantly wanting in adult individuals of this species may

* Dobson, Ann. Mus. Civ. Genova, (2ª) ii. (1885) pp. 16–17.

still, perhaps exceptionally only, be found in a very rudimentary state in young ones.

According to the above, the synonymy of the species under consideration is as follows:—

Rh. fumigatus, Rüppell (1842), cotypes, in the Senckenberg Museum, from Shoa.
=*Rh. macrocephalus*, v. Heuglin (1877), cotypes, in the Stuttgart Museum, from Adowa, Abyssinia.
=*Rh. Antinorii*, Dobson (1885), type, in the Genoa Civic Museum, from "Daimbi, Shoa" *.

Measurements of Rh. fumigatus, macrocephalus, *and* Antinorii.

	Rh. fumigatus.			*Rh. macrocephalus.*		*Rh. Antinorii.*	
	Cotypes. (Mus. Senck.)		Topotype. (Stockholm.)	Cotypes. (Mus. Stuttg.)		Type. (Mus. Gen.) *Fide* Dobson †.	Jifa Medir, Somali. (B. M.)
	Ad.	Ad.	♂ ad.	♀ imm.	♀ ad.	Ad.	♂ ad.
	mm.	mm.	mm.	mm.	mm.	mm.	mm.
Forearm.....	54	54	52·5	52·7	?	52·1	52·8
3rd finger, metacarpal ..	38	38	37	38	37·8	35·6	36·6
,, 1st phalanx..	16	17	15·8	15·3	17	16	16·1
,, 2nd phalanx .	31	32	?	28	31	33	29·5
4th finger, metacarpal ..	39·3	40	38	39	41	38·1	38·2
,, 1st phalanx..	9·5	10·5	9·8	9	10	10·2	10
,, 2nd phalanx .	18	?	18·2	18	20·2	19·1	18·3
5th finger, metacarpal ..	40·4	40·5	39	40·2	41·8	38·6	40
,, 1st phalanx..	12·5	12·3	12·3	12·1	13	12·7	12·1
,, 2nd phalanx .	13 8	14·2	13·5	13·8	14·1	13·7	14·1
Tail, from anus ‡	22·6	21	23	26·8	25·5	24·1	25

* Probably Dembea, Abyssinia.

†. Rendered from "inches" into millimetres. Dobson's method of measuring the metacarpals was probably slightly different from my own; in his measurement of the 2nd phalanx of the 3rd finger is, perhaps, included the (so-called) 3rd phalanx. For comparison, I subjoin measurements of a specimen of "*Rh. Antinorii*" in the British Museum.

‡ Allowing for a shrinkage of 1 or, at most, 2 mm. in Rüppell's (mounted) types. The exact position of the hinder border of the anus cannot be ascertained in these specimens.

Rhinolophus acrotis and *Rh. Andersoni*.

Rh. acrotis *.—There is a type (♂ ad.) and a topotype † (♂ jun., both in alcohol) preserved in the Stuttgart Museum, labelled "No. 986; Keren, v. Heuglin; 1862." Peters ‡ put the name down, without comment, as a synonym to *Rh. clivosus*, Cretzsch.§ (type from Mohila, Arabia), stated by him to occur both in Arabia and N.E. Africa. I find no reference to this species in Dobson's writings.

Results.—Rh. acrotis is decidedly the same *species* as recently described by Oldfield Thomas || under the name *Rh. Andersoni*. The types agree in all specific characters—in the nose-leaves, the ears, the structure of the wings and membranes, the tail, &c.; like *Rh. Andersoni* the type and topotype of *Rh. acrotis* lack every trace of the lower p_3 and upper p^2. There is, however, a certain difference in the size. It *may be* due to the fact that the type (as well as the other specimens in the British Museum) of *Rh. Andersoni* is an immature individual. But the topotype of *Rh. acrotis* is also a young animal, by no means more advanced in age than the type of *Rh. Andersoni*, and nevertheless it is markedly larger. When, furthermore, considering that *Rh. acrotis* and *Rh. Andersoni* were procured in widely separated localities—the former in Erytrea, the latter in the Eastern Egyptian Desert,—I find it, at least provisionally, more advisable to keep them distinct as *subspecies* so long as it remains unproved that the obvious difference in size falls within the limits of individual variation. According to this, the nomenclature of the forms in question would be:—

Rh. acrotis, v. Heuglin (1861), type, in the Stuttgart Museum, from Keren, Erytrea, about 15° 45′ N., 38° 30′ E.

Rh. acrotis Andersoni, Thomas (1904), type, in the British Museum, from the Eastern Egyptian Desert, about 22° N., 35° E.

* Von Heuglin, "Beiträge zur Fauna der Säugethiere N.O.-Afrika's," N. Act. Ac. Cæs. Leop.-Car. xxix. (1861) p. 10.

† It would certainly do no harm to regard both of these specimens as "cotypes" (as they were called in a letter kindly sent me by Prof. Lampert), since they are the same species, taken by the same collector in the same locality. As, however, v. Heuglin, in the paper just referred to (p. 4), mentions *only* the adult male, I have to acknowledge this fact and restrict the term "type" to this specimen, calling the other a "topotype."

‡ Peters, MB. Akad. Berlin, 1871, p. 311.

§ Cretzschmar, Rüppell's 'Atlas' (1826), p. 47, Taf. xviii. Conf. also Peters, MB. Ak. Berlin, 1866, p. 16; and C. von der Decken, 'Reisen in Ost-Afrika,' iii. 1 (1869), Taf. ii. fig. 2.

|| Oldfield Thomas, Ann. & Mag. Nat. Hist. (7) xiv., Aug. 1904, p. 156.

Measurements of Rh. acrotis *and* Rh. a. Andersoni.

	Rh. acrotis.		*Rh. a. Andersoni.*		
	Type. ♂ ad.	Topo-type. ♂ jun.	Type. ♂ imm.	Paratypes. (3 imm. spcms., skins.)	
				Min.	Max.
	mm.	mm.	mm.	mm.	mm.
Forearm	48·2	49·3	46·2	44·2	46·8
3rd finger, metacarpal	32·8	32·2	29·5	27	29·2
„ 1st phalanx	16	16·4	14·3	13·8	14·8
„ 2nd phalanx	24·7	26	? 23	21·8	23·1
4th finger, metacarpal	35	34	31	29·7	31·2
„ 1st phalanx	9·8	10	8·9	8·8	9·1
„ 2nd phalanx	16·7	15·7	? 14·5	13·5	15·5
5th finger, metacarpal	35·2	34·8	31·3	30	32·2
„ 1st phalanx	10·7	11·1	9·9	9·8	10
„ 2nd phalanx	15	14·5	13·2	12·2	13·8
Tail, from anus	32·8	31	?	?	?

Rhinolophus minimus and *Rh. hipposiderus.*

Rh. minimus *.—The type, an immature but full-grown male (in alcohol), preserved in the Stuttgart Museum, is labelled "No. 987; Keren, v. Heuglin; 1862." It was identified by Peters † with *Rh. hipposiderus*. Dobson ‡ adopted this view.

Results.—Rh. minimus is undoubtedly referable to *Rh. hipposiderus* as a *species*. It has the decisive characters of this latter, above all: (1) the comparatively well-developed upper p^2, placed entirely in the tooth-row; (2) the long and very narrow sella, with the lateral margins convergent towards the summit, the summit itself sharply pointed; (3) the 5th metacarpal shorter than or, at most, equal to the 4th. But it is decidedly smaller and, especially, shorter-tailed. There is in the British Museum a specimen from Sennar (♀ ad., in alcohol, no. 47. 5. 27. 48) exactly like the type of *Rh. minimus*. This form therefore, probably, should be kept distinct as a small short-tailed race of *Rh. hipposiderus*.

* Von Heuglin, *op. cit.* (1861) p. 6; conf. also p. 4.
† Peters, MB. Akad. Berlin, 1871, p. 310.
‡ Dobson, Cat. Chir. Brit. Mus. (1878) p. 117.

Measurements of Rh. hipposiderus *and* Rh. h. minimus.

	Rh. hipposiderus.			*Rh. h. minimus.*	
	Schlangenbad. ♀ ad.	Switzerland. ♀ ad.	Hungary. ♀ ad.	Sennar. ♀ ad.	Type. Keren. ♂ imm.
	mm.	mm.	mm.	mm.	mm.
Forearm	40	41	41·3	36·5	36·3
3rd metacarpal	25·8	26·5	26·7	24·7	24·1
4th metacarpal	28·7	29·4	29·8	27·2	26·3
5th metacarpal	28·2	28·6	29·8	26·5	25·7
Tail, from anus ..	28·5	29·7	29·5	23·5	24·5

Rhinolophus auritus and *Rh. capensis.*

Rh. auritus *.—One type, a full-grown male (mounted), preserved in the Stockholm Museum, labelled "♂ perf.; Knysna, 3. iv. 1854†; Victorin; Grill 1859; Mam. Ex. no. 1907." Peters ‡, who examined the type, which still bears an additional label with his handwriting, regarded it as "ein etwas jüngeres Thier" of *Rh. capensis*. Dobson § has the name in his list of synonyms of *Rh. capensis*.

Results.—*Rh. auritus* is indistinguishable from *Rh. capensis*. The type may be called "ein etwas jüngeres Thier," in so far as the teeth are still unworn, but the epiphyses of the metacarpals and phalanges are not separate. As the description drawn up by Sundevall on closer study gives us a "key" to the riddle why that most careful zoologist was led to regard *Rh. auritus* as a new species, I think it of some interest to specialists to review the points of difference enumerated by him. *Rh. auritus* is stated to be:—(1) "affinis *Rh. capensi*; paullo minor: cubitus 45 mm."; the forearm in the type specimen measures (according to my method) 50 mm., in *Rh. capensis* (11 specimens) it varies between 47·6 and 51·5 mm.:

* Sundevall, in Victorin and Grill, "Zoologiska anteckningar under en resa i södra delarne af Caplandet åren 1853–1855," Kgl. Sv. Vet.-Akad. Handl. new ser. vol. ii. pt. 2, no. 10 (1858), p. 13.

† Probably a slip of the pen for 2. v. 1854. Only one specimen (the present one) was brought home by Victorin.

‡ Peters, MB. Akad. Berlin, 1871, p. 311.

§ Dobson, Cat. Chir. Brit. Mus. (1878) p. 121.

(2) "color multo obscurior quam in sp. reliquis affinibus"; the colour is as usual in *Rh. capensis*: (3) "aures evidenter majores quam in *R. capensi*, sed forma vix differunt"; the size of the ears is the same as in *Rh. capensis*: (4) "descriptio prosthematis nasi *Rh. euryalis* Blasii, exacte in sp. nostra quadrat," whereas in *Rh. capensis* "prosthema nasi simillimum eodem in *R. ferro equino*"; but it is a chief character of *Rh. capensis* that the sella is very much of the same form as in *Rh. euryale*, widely different from that of *Rh. ferrum-equinum*: (5) the 5th metacarpal is stated to be of the same length as the 4th, whereas in *Rh. capensis* it is "paullulum longior"; the length of the 5th metacarpal, compared with the 4th, is in *Rh. capensis* exactly as in the type of *Rh. auritus*: (6) "dentes multo minores quam in *R. capensi* et totum cranium paullo minus, gracilius"; the skull of the type is incomplete; the length of the upper and lower tooth-rows and of the mandible exactly as in *Rh. capensis*: (7) the upper p^2 is placed "paullulum inter dentes 2 proximos, non plane contiguos," whereas in *Rh. capensis* it is "omnino externus, dentibus 2 proximis perfecte contiguis"; there is in *Rh. auritus* a very narrow interspace between the upper canine and p^4, as in *Rh. capensis*: (8) the lower p_3 is present in *Rh. auritus*, in *Rh. capensis* "plane deesse videtur"; the presence or absence of the p_3 varies in *Rh. capensis* according to the age of the individual.

Although, as proved by the above, *Rh. auritus* is identical with *Rh. capensis*, the eminent Swedish zoologist was, nevertheless, quite right in pointing out all the differences as just enumerated. According to his own statement (*loc. cit.*) Sundevall had, for comparison with his *Rh. auritus*, two specimens of *Rh. capensis*. But these latter *cannot* have been *Rh. capensis*. All that he says about them (*vide supra*) tends to prove, in my opinion to evidence, that they were the species recently described by me as *Rh. augur* *. If in *every* case where Sundevall writes *Rh. capensis*, I substitute *Rh. augur*, the whole is perfectly correct. What, however, raises this assumption almost to certainty are the statements quoted above under (3), (4), (5), (6), and (7); they cannot possibly bear on *Rh. capensis*, but they are admirable when taken as a description of *Rh. augur*.

* Ann. & Mag. Nat. Hist., Nov. 1904, p. 380.

Measurements of Rh. auritus *and* Rh. capensis.

	Rh. auritus.	*Rh. capensis.*	
	Type. ♂ ad.	(8 adult spcms., 2 skulls.)	
		Min.	Max.
	mm.	mm.	mm.
Forearm	50	47·6	51·5
3rd finger, metacarpal	33·8	32·2	35
,, 1st phalanx	15	14·2	16·6
,, 2nd phalanx	24	23·3	26
4th finger, metacarpal	35·7	35	38
,, 1st phalanx	9·5	8·2	9·7
,, 2nd phalanx	15	15	16
5th finger, metacarpal	35·3	34	38
,, 1st phalanx	10·9	10·7	12
,, 2nd phalanx	13	12	14
Tail, from anus	20·5	20	23
Mandible	13·8	13·7	13·9
Front of upper *c* to back of m^3	7·7	7·3	7·7
,, lower *c* to back of m_3	8·2	8·2	8·3

LXIII.—*On a new Pycnogonid from the South Polar Regions.* By T. V. Hodgson, Biologist to the National Antarctic Expedition.

[Plate XIV.]

During her stay in winter-quarters in McMurdo Bay the 'Discovery' secured among the biological collections a very large number of Pycnogonids, the species as well as individuals being abundant. Among them is a species which possesses a pair of ambulatory appendages more than the number hitherto allotted to the group, and on that account it has been suggested to me by the Director of the Natural History Museum to publish at once a description of this interesting species.

It appears to be fairly common, a single individual being frequently captured either with the D net * or the tangles

* The D net is a light trawl, of which the iron frame is shaped like the letter D, hence the name; both from its lightness and its shape it proved particularly useful for work under the ice.

attached to the traps; occasionally two or even three specimens were taken at a haul, but this was unusual. It was first found in water of about 12 fathoms depth, and subsequent experience extended this to 125 fathoms. At depths greater than 25 fathoms only stationary traps could be used, but, as far as could be observed, the general nature of the bottom was essentially the same as in shallower water, though more uniform in character. It consisted of the same basaltic rubble as on shore, varying from a coarse sand or fine gravel to stones of variable size, interspersed at intervals with boulders, some of which were comparatively large. This mixture was very irregular close in shore, where details could be distinctly seen through the clear water. In depths of less than 25 fathoms the predominant feature of the fauna consisted of sponges (Monaxonida), and it was here that the bulk of the collections was made. In depths of over 100 fathoms, Polyzoa were most abundant. Taking into consideration the methods employed, this Pycnogonid seemed to be equally common in both localities.

A new genus has been proposed for the reception of this species, but from the description given it will be seen that the only feature of importance which separates it from the genus *Nymphon* is the presence of a fifth pair of legs, a character which separates it from all Pycnogonids hitherto known.

Pentanymphon, gen. nov.

Body smooth, very slender, with lateral processes widely separated. Five pairs of ambulatory appendages.

Mandibles well developed, 2-jointed, chelate.

Palps 5-jointed.

Ovigerous legs 10-jointed, terminating in a claw, the last four joints with a single row of denticulate spines.

Pentanymphon antarcticum, sp. n. (Pl. XIV.)

Mandibles: chelæ long and slender, curved at tips, with short, stout, uniform and close-set teeth.

Palps: terminal joint longer than the preceding, which is in turn half the length of the third.

Ovigerous legs: terminal claw dentate; denticulate spines with seven pairs of lateral teeth, the first being very small.

Ambulatory legs with a well-developed claw and two auxiliaries; setæ arranged in four rows on the last three joints.

The above characters are probably quite sufficient for identification, and a more detailed description may now be given.

The body, including the proboscis, is quite smooth and averages between 7 and 10 millimetres in length. Anteriorly it is curved downwards so that the proboscis is inclined at a moderate angle. It is slender, and the lateral processes are long, the segmentation being distinct and immediately behind them. The ocular peduncle is short and is situated just in front of the first pair of lateral processes. Four eyes can be distinguished, but the state of their development is a variable feature.

The abdomen is small, ovoid, and directed obliquely upwards.

The proboscis is perfectly smooth, cylindrical, with a very slight swelling along the middle of its length; the extremity is rounded.

The mandibles arise above and slightly in front of the proboscis on an enlargement of the cephalon, which is here rather more than twice its diameter posteriorly. A distinct projection of the cephalon forms a base for these appendages, which are 2-jointed. The scape is longer than the chela and it is also longer than the proboscis. It is smooth, there being only a very few setæ scattered along its length and a whorl of them at its distal extremity. The chela is rather smaller than the scape, with fine setæ scattered all over the proximal half. The fingers occupy nearly half the length of the joint; they are slender and much curved near the tip so as to cross when closed. The inner border of both fingers is furnished with a row of fairly stout teeth of nearly uniform size.

The palps arise below and somewhat behind the mandibles, more strictly at the side and base of the proboscis. They are 5-jointed, the second joint being considerably the longest, the fourth is half the length of the third, and the fifth is longer than the fourth. The first joint is very small and devoid of setæ; the second, with the succeeding one, bears a few setæ sparsely distributed along its entire length, the setæ being most plentiful at the distal extremity, where they form an imperfect whorl round the joint. The fourth joint is half the length of the third and is more abundantly supplied with setæ especially about the outer side, a few being scattered elsewhere. The fifth joint is longer than the preceding, rounded at the distal extremity, and more richly supplied with setæ: these are stouter than on the other joints, but have essentially the same arrangement;

they also appear to be liable to injury and may be much broken.

The ovigerous legs, which are present in both sexes, arise on very short processes from the lower side of the cephalic segment immediately in front of the first pair of lateral processes. They are 10-jointed and armed with a dentate claw. The first joint is quite small and about three times the length on one side that it is on the other. The two following joints are subequal in size and devoid of setæ; the proximal one is stout, the distal one more slender, somewhat curved, and its distal termination very oblique. The fourth joint is nearly four times as long as the preceding one, slightly curved and stouter at its distal end, which bears a few setæ; two or three more are to be found on the outer margin of the joint, while on the inner margin a small protuberance occurs at about a quarter of its length. The fifth joint is conspicuously the longest and its diameter increases towards the distal extremity; it is sparsely setose along the greater part of its length. The sixth joint is rather more than half the length of its predecessor, setose along the inner margin, and with somewhat stouter setæ distally. Of the four terminal joints the proximal is the longest and the remainder are subequal in length, but progressively more slender. They only bear an occasional seta and a single series of denticulate spines. The last three joints bear a pair of long setæ at the distal extremity, and the spines consist of a slender shaft with a swollen base. Near the base is a pair of small teeth, then follow two pairs of comparatively long slender ones; the remaining four pairs are more delicate and blade-like. The terminal claw is



Claw and denticulate spines of ovigerous leg, × 130.

provided with about nine slender teeth (see figure). These teeth as well as the denticulate spines seem to be particularly liable to injury, as they are more or less broken in many specimens.

With regard to the ambulatory appendages, all the five are practically of the same size and proportions, while the character and arrangement of the setæ are identical.

Of the three coxæ the first and third are subequal in length, the third being, if anything, slightly the longer. The second coxa is slightly longer than the other two together, and all of them bear minute setæ.

The femur is a comparatively stout joint, slightly curved, sparingly supplied with short setæ and a few very long ones. One or two of the latter occur along the shaft and a few at the distal extremity. The first tibia is slightly longer than the femur, setose along its entire length; small setæ are most numerous, and the longer ones are scattered irregularly among them. The second tibia is considerably the longest joint of the entire appendage and setose, like the preceding joints, along its proximal half; then the setæ become delicate spines rather than true setæ and are arranged in four distinct rows. The lateral rows are, of course, the most prominent, and the setæ on the inner side of the joint are most numerous and regular. Some half-dozen spines fringe the distal inner margin.

Of the two remaining joints, the tarsus and the propos, the former is the longer, but in other respects they are alike. Both bear four rows of setæ, those on the inner margin being regular and by far the most numerous, besides having the nature of spines rather than true setæ. The terminal claw is long and provided with two auxiliaries of about a quarter the size.

Altogether 28 specimens of this interesting species were taken, but many of them are in a more or less mutilated condition. Five of them are females whose limbs are distended with ova. Two males are carrying eggs, and those on another are just hatched. The egg-masses are ovoid in shape and somewhat irregular; this is possibly owing to the freezing they underwent between the surface of the ice and the collecting-pots. The eggs are very small and numerous.

I understand that Mr. W. S. Bruce, of the Scottish Antarctic Expedition, has taken several specimens of a ten-legged Pycnogonid from the Weddell Sea, which may prove to be identical with this species.

I am indebted to the Council of the Marine Biological Association for accommodation at their Plymouth Laboratory, and to my friend Mrs. L. E. Sexton for the drawings.

EXPLANATION OF PLATE XIV.

Pentanymphon antarcticum, female, enlarged six times.

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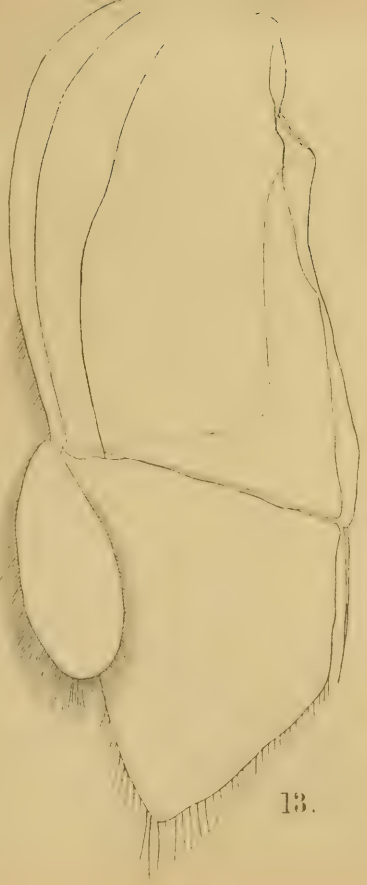
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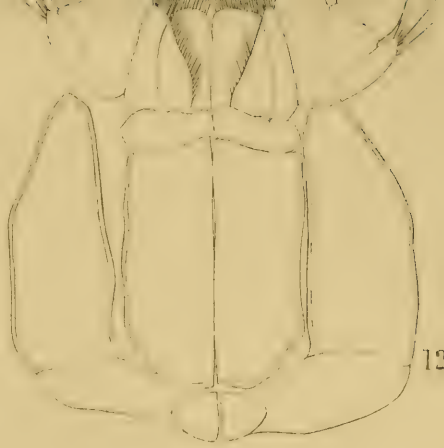
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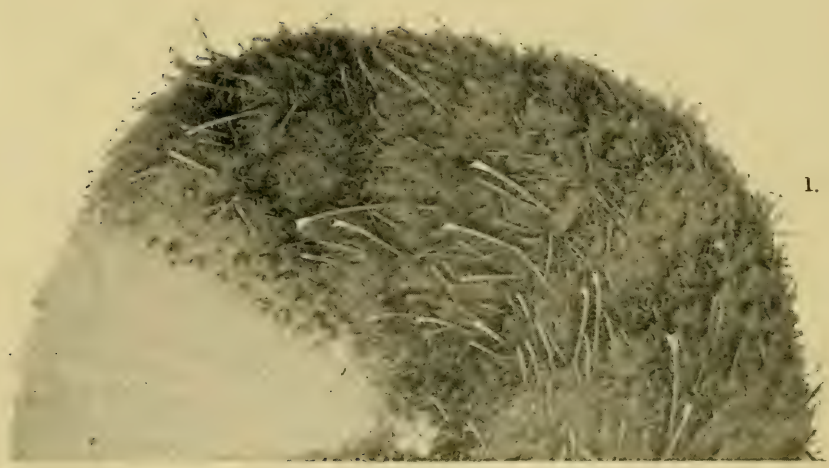


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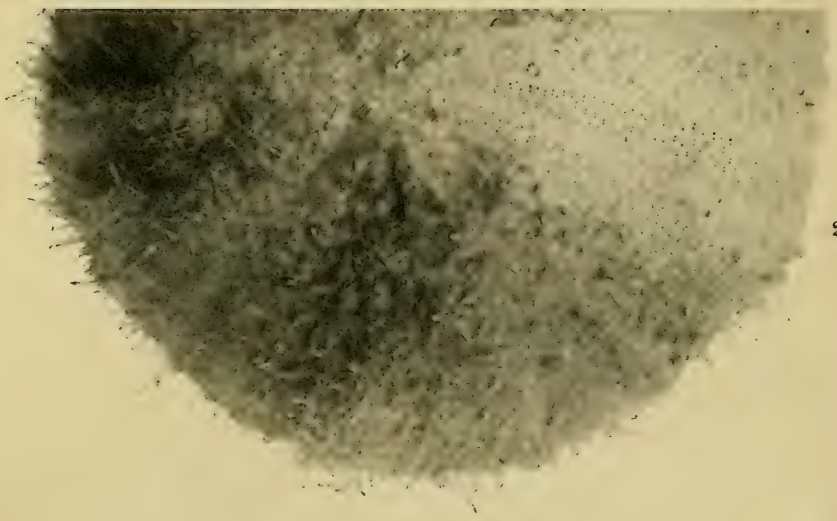
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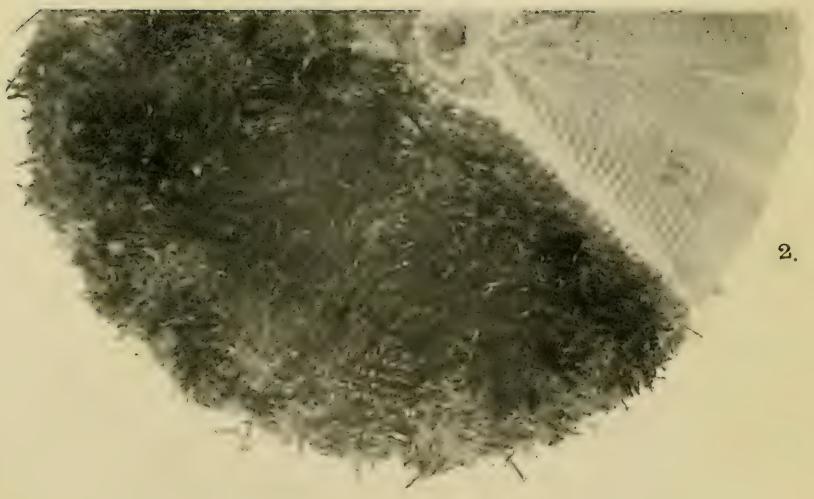
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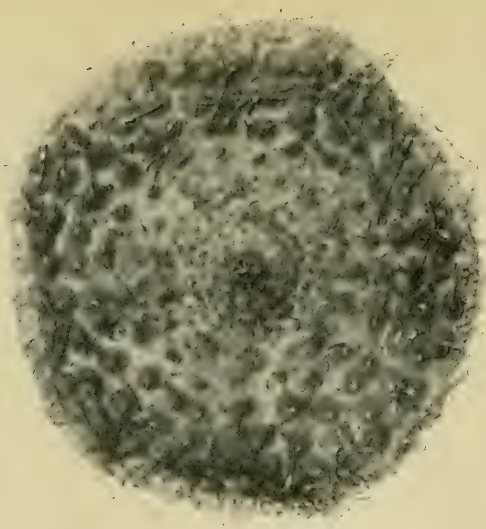
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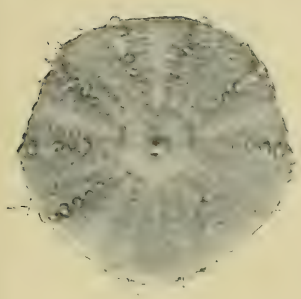
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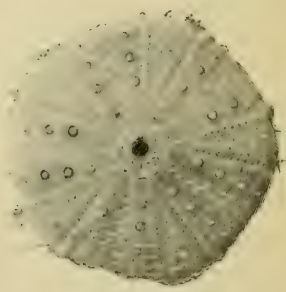
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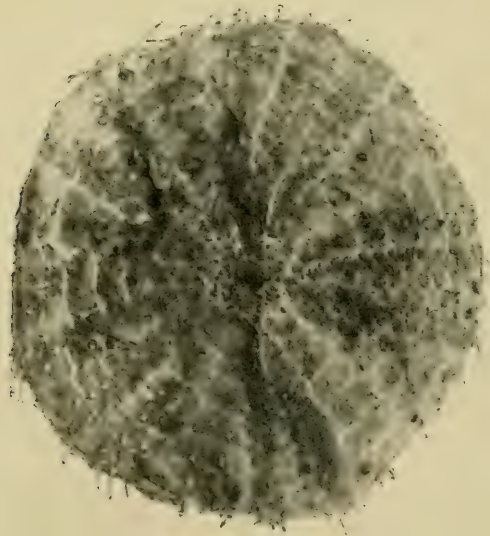
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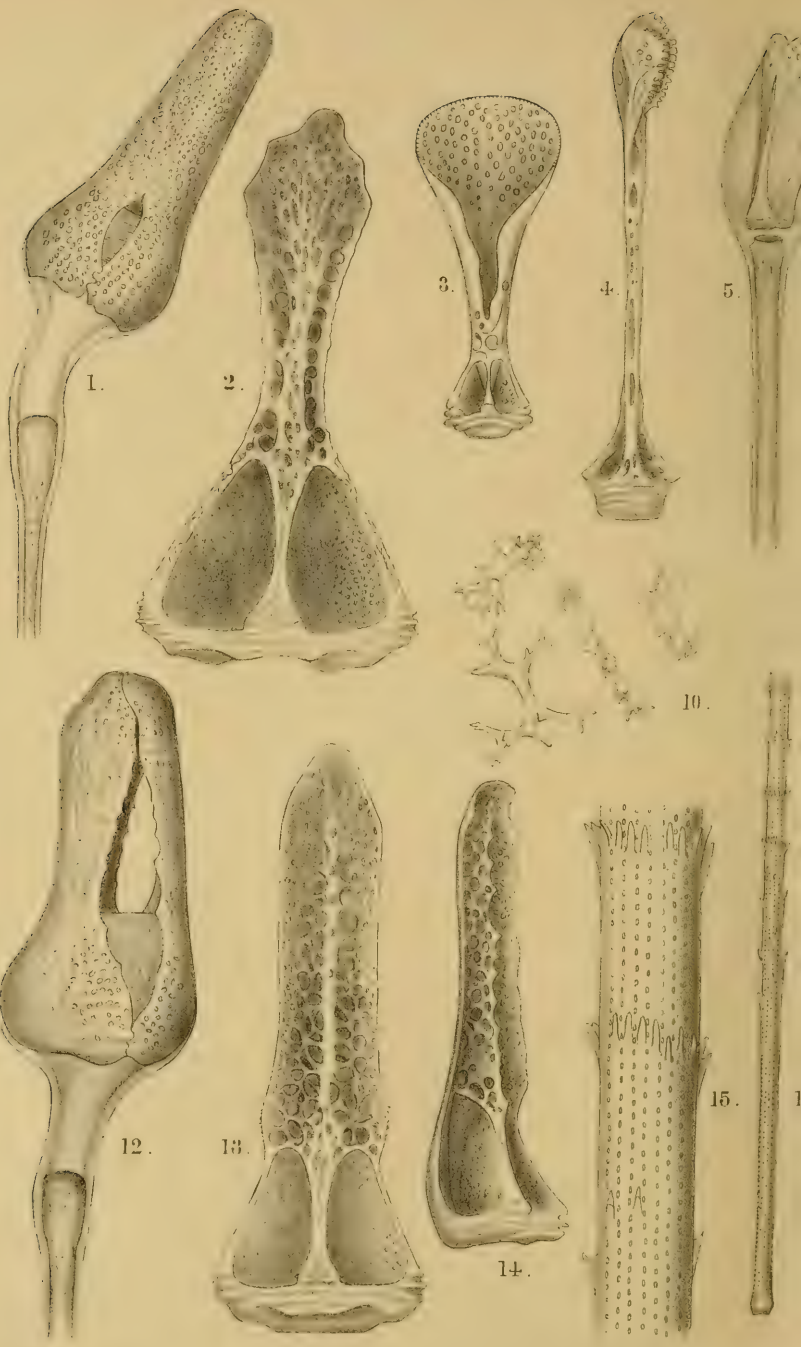
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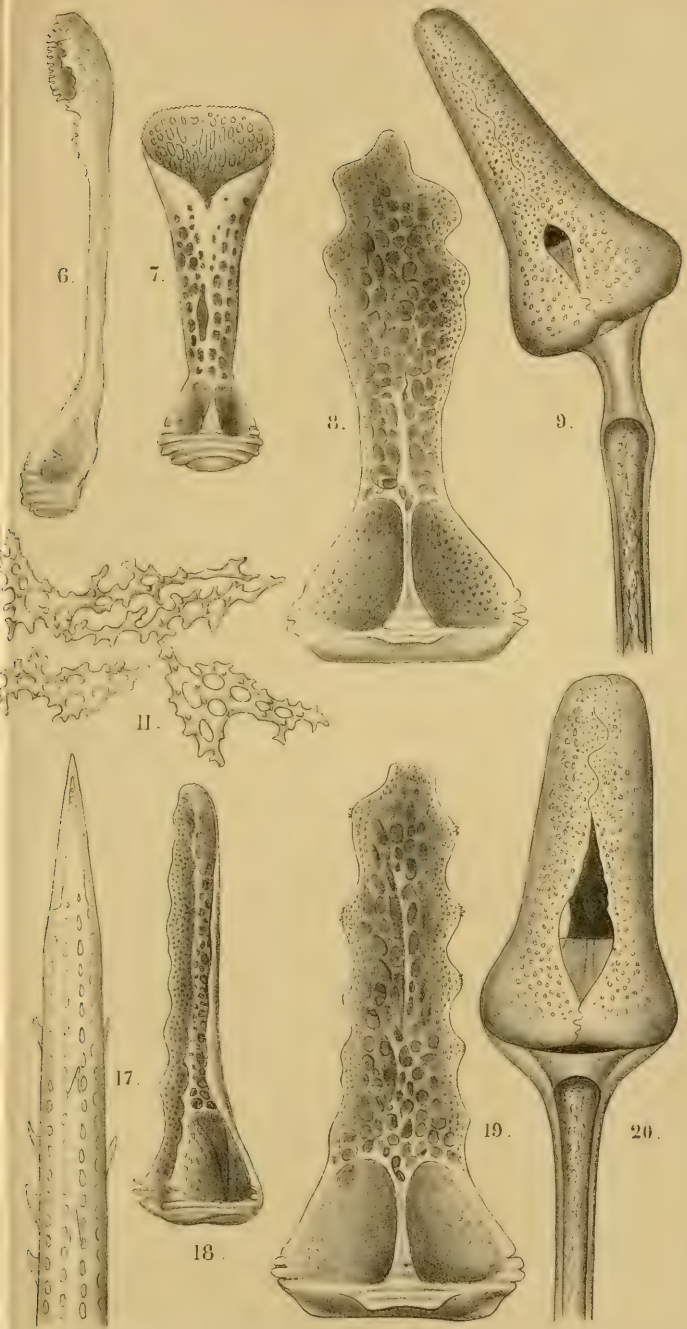


2.



Th. Mortensen del.

Figs. 1-3, 10, 12-14. ASTHENOSOMA IJIMAI. F
Figs. 15-17. PHORMOSOMA



4-9,11,18-20. ARÆOSOMA OWSTENI.
ERTICILLATUM.

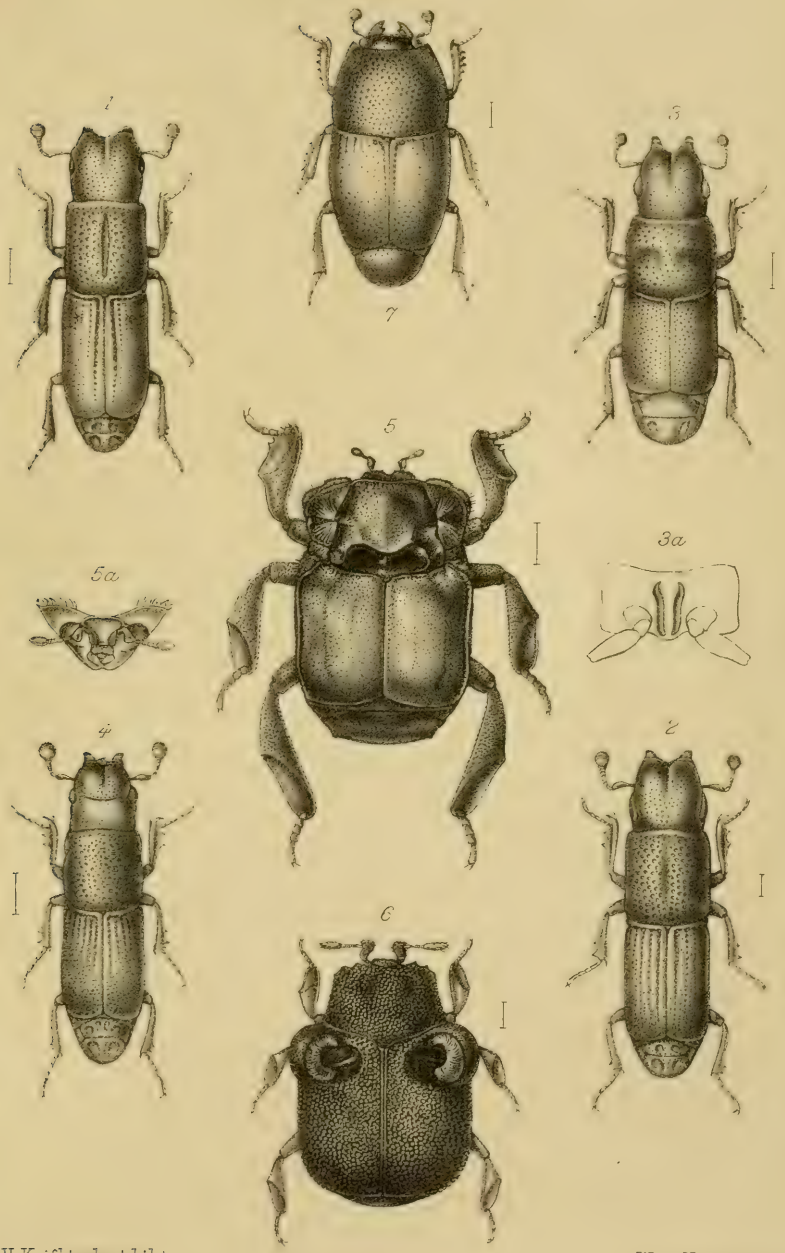
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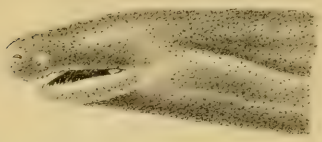
Figs. 1-5, 8, 10, 12-14. ASTHENOSOMA IJIMAI. Figs. 4-6, 11, 16-20. ARCHEOSOMA OWSTEDII.
Figs. 15-17. PHORMOSOMA VERTICILLATUM.



H. Knight ad nat. lith.

West, Newman imp.

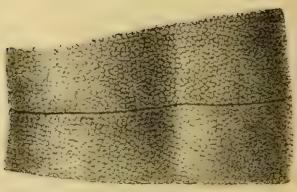
Histeridæ.



1b. ×3.



1a. ×3.



1c. ×4.

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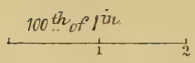


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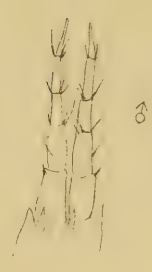
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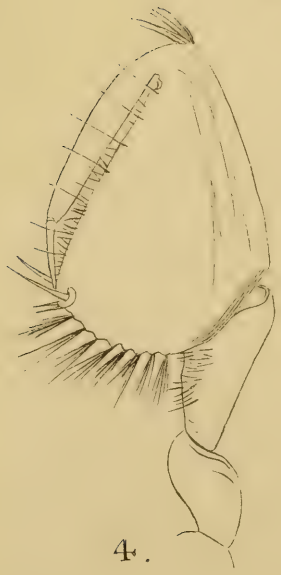
1.



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5.

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See page 274



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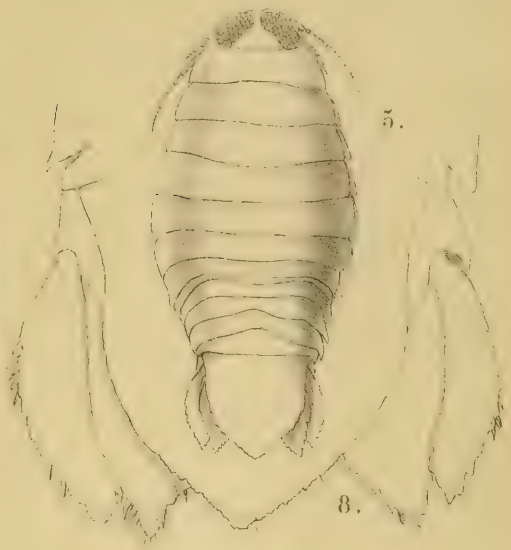


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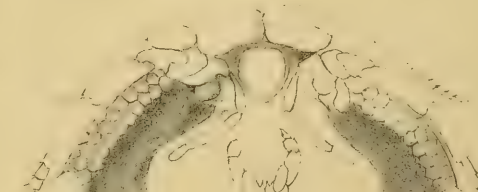
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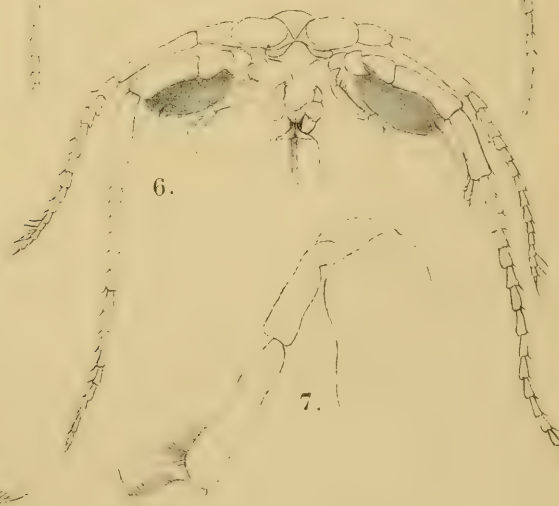

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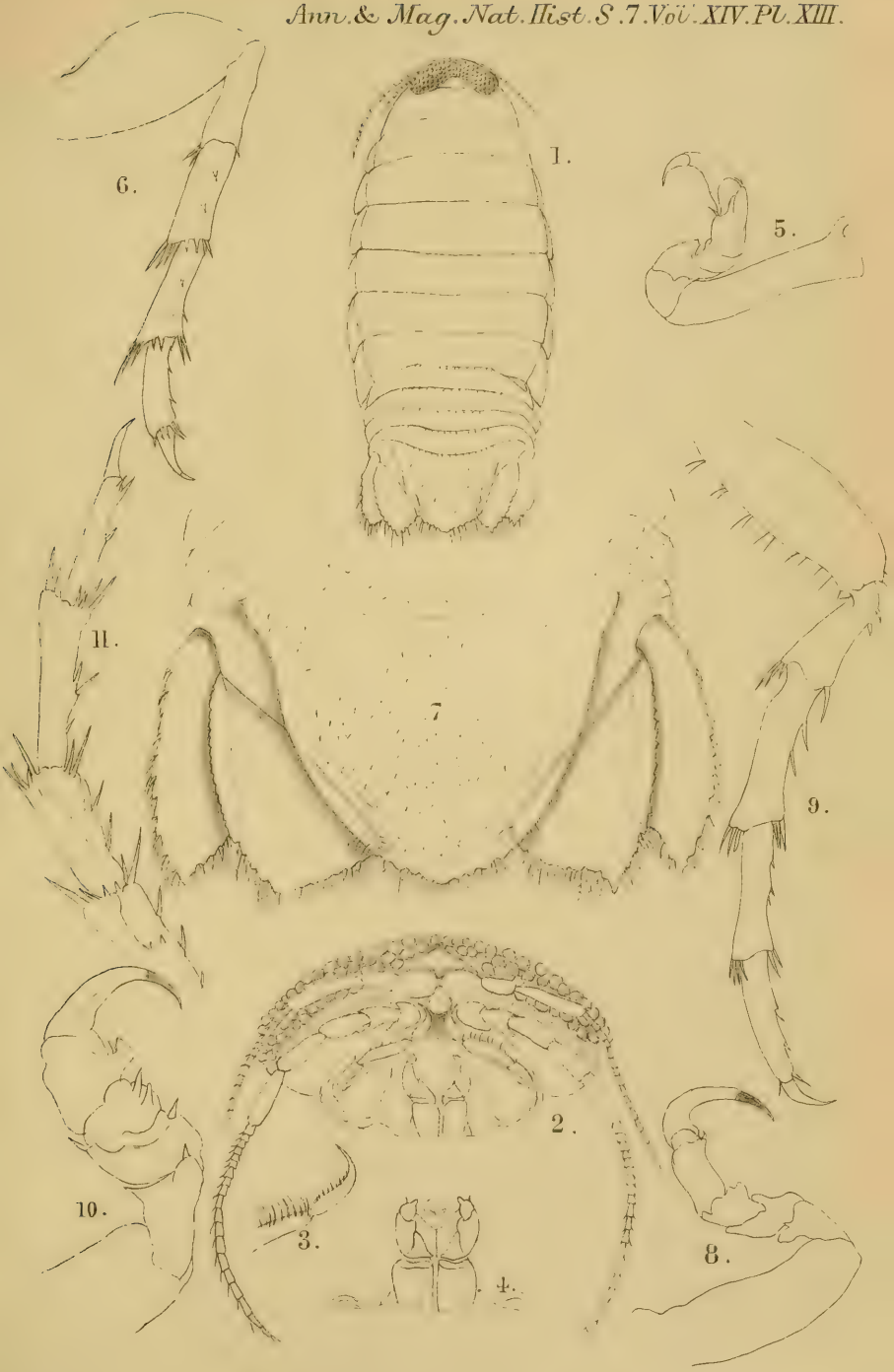

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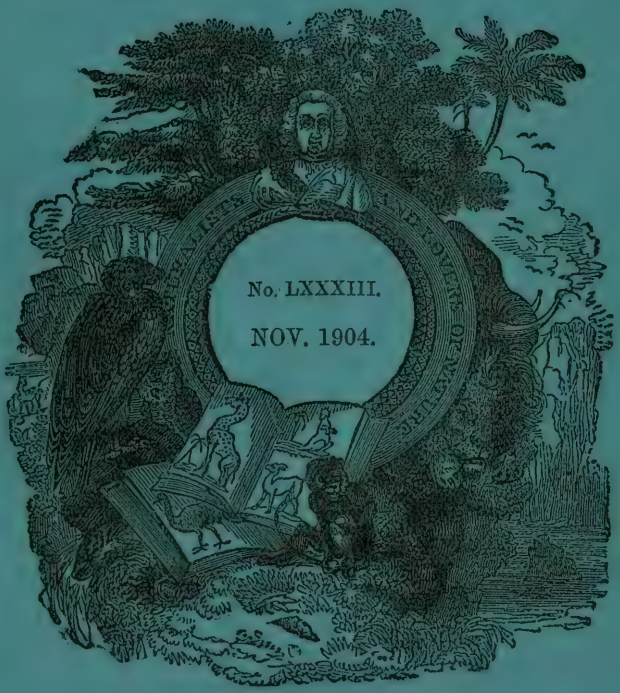
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